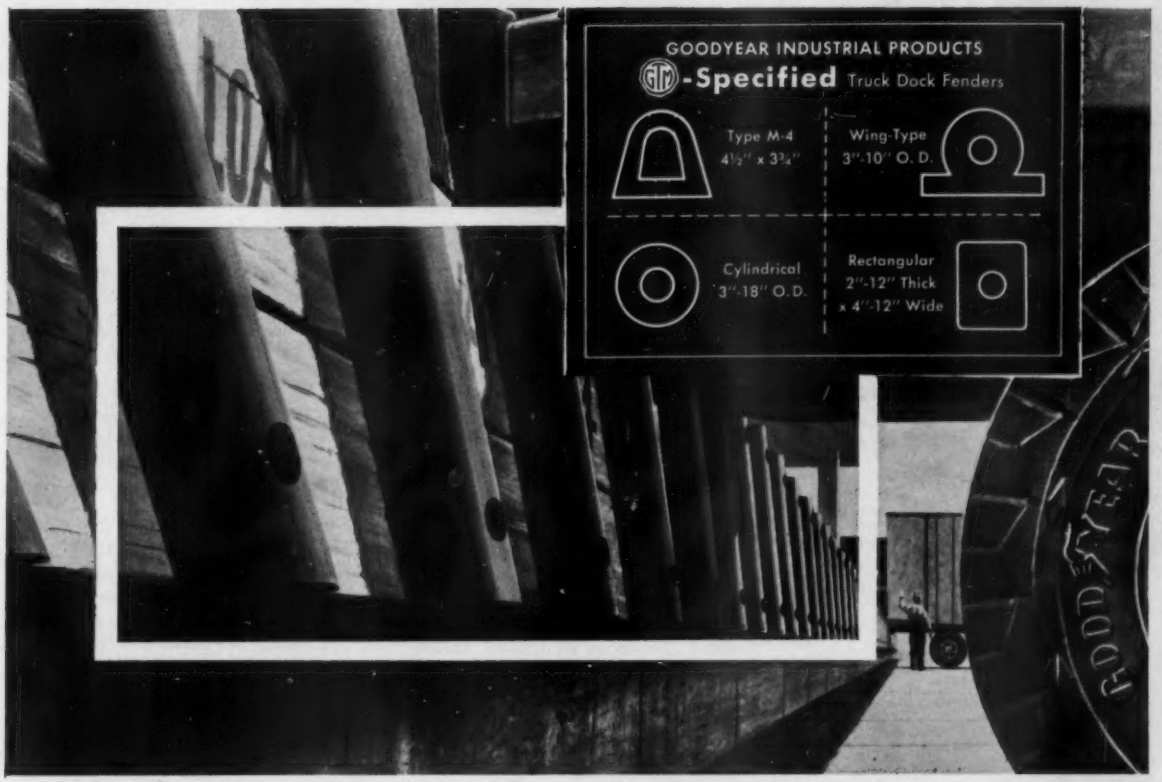
How to back into sizable savings

BACKSTOPPING heavily loaded trucks—as they jockey backward into position—is too tough a job for any unprotected loading dock. So you'll find the edge of most docks badly cracked and splintered—in almost constant need of expensive repairs.

At one big West Coast Terminal, for example, replacements ran to $500 every six months or so. And that's not counting the tie-up of needed loading facilities during each rebuilding operation. So the G.T.M.—Goodyear Technical Man—got a lot of attention when he suggested rubber Truck Dock Fenders.

The result: with the G.T.M.'s tremendously resilient fenders absorbing all the punishment—*no repairs have been necessary in over a year and a half now.* And this enthusiastic user has installed them on his other docking facilities.

His savings are just beginning, too. For these Truck Dock Fenders are modeled after those that cushion the docking of giant ocean liners—in some cases serving more than 25 years without appreciable wear. For the full story, contact the G.T.M. through your Goodyear Distributor—or write Goodyear, Industrial Products Division, Akron 16, Ohio.



TRUCK DOCK FENDERS BY

GOODYEAR

THE GREATEST NAME IN RUBBER

For more facts circle 502 on Reply Card

RICHARD H. MORRIS
Editorial Director

EDITORIAL STAFF

THOMAS E. HANSON, *Editor*
R. L. MARINELLO, *Managing Editor*
EMIL B. SKUBIK, *Associate Editor*
H. E. B. ANDERSON, *Associate Editor*
M. E. WEISSMAN, *Associate Editor*
M. E. HENIKEN, *Equipment Editor*
VERNON T. KEMPF, *Electrical Editor*
MILDRED NOVOSEL, *Editorial Assistant*
BEA BERGHORN, *Editorial Assistant*
FLORENCE JARRETT, *Editorial Assistant*
JAMES E. WILCOX, *Art Director*
RICHARD TREFILEK, *Staff Artist*
TED CIEPLEY, *Draftsman*

Technical Publishing Co.
308 E. James St.
Barrington, Ill.

KINGSLEY L. RICE, *President*
ARTHUR L. RICE, JR., *Exec. Vice Pres.*
EDWIN C. PROUTY, *Vice Pres.*
EDWIN C. PROUTY, JR., *Secretary*
ARTHUR L. RICE, JR., *Treasurer*
ANDREW W. KRAMER, *Tech. Asst. to Pres.*
JOHN O. AARVOLD, *Prod. Manager*
WM. J. SALKELD, *Asst. Prod. Mgr.*
EUGENE ZUCKER, *Research Director*
MARGARET HOAGLAND, *Research Assoc.*
JOSEPHINE GEAR, *Asst. Adv. Mgr.*

DISTRICT MANAGERS

BOSTON & NEW ENGLAND
Charles R. Lippold
5 Spring St., Riverside, Conn.
Phone: NEptune 7-2210

NEW YORK: Richard Y. Fuller
842 Graybar Bldg., New York 17, N. Y.
Phones: MUrray Hill 5-3779
LExington 2-0308

PHILADELPHIA: Oscar Wilde
1235 Jericho Road, Abington, Pa.
Phone: TUrner 7-6688

JOHN R. MORRISON
Western Sales Manager

CHICAGO: John R. Morrison
Walter Painter
Robert L. Dickson
110 S. Dearborn St., Chicago 3, Ill.
Phone: DEarborn 2-5453

OHIO-MICHIGAN:
Robert L. Dewey
557 W. Glenwood St.
North Canton, Ohio
Phone: HYacinth 9-7593

PITTSBURGH: James B. Tafel
404 Frick Bldg., Pittsburgh, Pa.
Phone: COurt 1-4878

CALIFORNIA:
Connie J. Grabb, Jr.
1145 Wellington Ave., Pasadena, Calif.
Phone: MUrray 1-6004

DENVER: McDonald-Thompson
Robert H. Heidersbach
620 Sherman Street
Denver 3, Colo.
Phone: KEystone 4-4669

WASHINGTON-OREGON:
McDonald-Thompson
Harry Abney, 1008 Western Ave.
Seattle 4, Wash. Phone: MAin 3-3766

SOUTHWEST: McDonald-Thompson
Frank N. Vickrey, Rm. 214
3217 Montrose Blvd., Houston 6, Texas
Phone: JAckson 9-6711

Ted R. Trautman, 2010 South Utica
Tulsa 4, Okla. Phone: Riverside 3-1981

BPA NBP

Copyright 1959 by Technical Publishing Co.

'ROUND ABOUT

with the editors in field and office

Edited by R. L. Marinello

New Assignment for Don Wangelin

Don J. Wangelin has been assigned to the Pure Oil Company's new general office building project near Palatine, Illinois. He will act as assistant to **W. D. Kinsell,** who, as project engineer, is handling the relationship with the architect and general contractor on the building.

Until his new appointment, Don Wangelin had been associated with the company's research division since his graduation as a mechanical engineer from the University of Michigan in 1939. He was appointed plant engineer for the research and development laboratories in 1945 and earlier this year was named division director of engineering research and plant services at the company's research center at Crystal Lake, Illinois.

He has served as president of the Fox Valley Chapter of the American Institute of Plant Engineers during the past year and is also a member of the American Society of Mechanical Engineers.

Put Old Equipment to Good Use

"OPERATION BUTTON JAR," is an unusual project being conducted by Reese and Miller, Inc., and the Case Institute of Technology. The purpose of this project is to gather discarded material and equipment from industry, reclassify it, and distribute it to colleges that can put it to good use in their laboratories.

Among the items initially requested are assorted sizes of hook-up wires, relays, solenoids and limit switches, meters, rheostats and timers, valves, power transmission equipment, fastening devices, control devices, electronic hardware, photographic equipment and materials, machine shop supplies and tools, technical books and bound periodicals, and visual aids.

There are three primary sources that industry can draw upon to provide the needed "buttons": one is manufacturing rejects—equipment which cannot be sold commercially but is still in usable form as is or with minor repair work. The second source is product samples. The third is discarded plant equipment that may still be in good usable form for service in the laboratory.

If your company would like to contribute equipment to this cause, contact Reese and Miller, Inc., Cleveland, or Case Institute of Technology, University Circle, Cleveland 6, Ohio.

Westinghouse Appoints New Director of Works Engineering

Burr Tupper has been appointed director of works engineering for the Westinghouse Electric Corporation in Pittsburgh, Pa., succeeding **Walter W. Wendelken.**

Mr. Tupper will direct the construction of all new company plants and facilities throughout the country. Mr. Wendelken, who plans to retire, has been director of works engineering since 1953.

Mr. Tupper became associated with the company as staff assistant in the headquarters manufacturing department in 1953. Later the same year he became assistant to the manager of the company's Sturtevant division in Hyde Park, Mass. In 1956, he transferred to the air conditioning division as manager of manufacturing, the position he held until his present assignment.

Mr. Wendelken was employed by the company in 1917 at the East Pittsburgh works. He held positions there as draftsman in the works engineering department, supervisor of lighting, works electrical engineer and electrical superintendent of the construction department. From 1949 until 1953 he served as chief electrical engineer of the headquarters works engineering department, the position he held until he became director of works engineering.

Standards Price List and Index

THE 1959 Price List and Index of American Standards, just published, is available free from the American Standards Association. The publication lists the more than 1800 stand-

Subscriptions: U.S.A. $10, Canada $11. Other countries $12 per year. Single copies $1. Change of address: Send to PLANT ENGINEERING, Circulation Division, Barrington, Illinois. Please supply position title, company name, company address. Request must reach us by the 15th of month to make the change effective with following month's issue. Published monthly and accepted as controlled circulation publication at Chicago, Ill.

▲ The Muller-Pinehurst Dairy in Rockford, Illinois is a striking example of modern, functional architecture. Natco Ceramic Clear Glaze Vitritile interiors require only soap and water maintenance for complete sanitation.

INSIDE or OUT...for the look that's always new look first to *NATCO*...

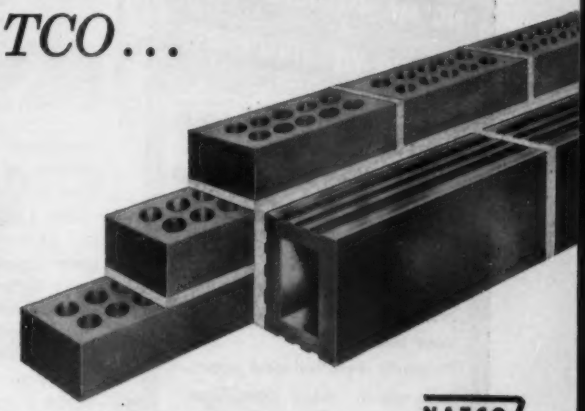
your best source for a complete line of structural clay products for masonry construction

Wherever a distinctive, modern appearance, as well as utility, is desired, Natco offers walls of enduring beauty. Years after installation, Natco products retain the same *new look* in color, line and texture that they have on opening day.

The Muller-Pinehurst Dairy of Rockford, Illinois is a good example of how progressive architects are employing Natco materials in the construction of attractive, efficient commercial buildings. Here, the interior walls of Natco Ceramic Clear Glaze Vitritile combine lasting beauty and utility with such practical features as fire, chemical, and wear resistance.

Natco "Diamond" Buff Face Brick, used for exterior walls, provides strength and durability, and further enhances the striking simplicity of the structure's design.

For complete information, write to your nearest Natco branch office. More than 40 basic Natco structural clay products are available, including a complete line of glazed and unglazed facing brick in Standard, Norman and Roman sizes to meet all requirements.



NATCO
CORPORATION

GENERAL OFFICES: 327 Fifth Avenue, Pittsburgh 22, Pa.
BRANCH SALES OFFICES: Boston • Chicago • Detroit Houston • New York • Philadelphia • Pittsburgh • Syracuse Birmingham, Alabama • Brazil, Indiana
IN CANADA: Natco Clay Products Ltd., Toronto

Architects Hubbard and Hyland found Natco "Diamond" Buff Face Brick ideally suited for the dairy's exterior walls. General Contractor was Larson and Sons, Inc. of Rockford. ▼

PROTECT Your Machinery with
THOMAS
ALL METAL
FLEXIBLE COUPLINGS

NO LUBRICATION
NO MAINTENANCE
NO WEARING PARTS

Future maintenance costs and shutdowns are eliminated when you install Thomas Flexible Couplings. These all-metal couplings are open for inspection while running.
They will protect your equipment and extend the life of your machines.
Properly installed and operated within rated conditions, Thomas Flexible Couplings should last a lifetime.

UNDER LOAD and MISALIGNMENT ONLY THOMAS FLEXIBLE COUPLINGS OFFER ALL THESE ADVANTAGES.

1 Freedom from Backlash Torsional Rigidity
2 Free End Float
3 Smooth Continuous Drive with Constant Rotational Velocity
4 Visual Inspection While in Operation
5 Original Balance for Life
6 No Lubrication
7 No Wearing Parts
8 No Maintenance

Write for Engineering Catalog

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA, U.S.A.

For more facts circle 504 on Reply Card

'ROUND ABOUT

ards approved to date by the association.

Fields covered include: automotive, chemical, civil engineering and construction, commercial standards, electrical engineering, ferrous and nonferrous materials and metallurgy, materials handling, mechanical engineering, mining, and many others.

If you would like a copy of this price list and index, send your request to American Standards Association, Department PR 66, 70 East 45th Street, New York 17, N. Y.

Mixing Business With Outside Activities

Harry Logiodice, plant maintenance engineer, Liberty Baking Company, Pittsburgh, has just been elected president of the Pittsburgh East End Industrial Management Club. The Club is an affiliate of the East Liberty Branch YMCA.

Mr. Logiodice has served in a number of capacities in the Club before assuming the presidency. Elected to serve with him were: Howard Sample, of the Lawrenceville Screw Company, as vice president; John Sundo, McGraw Edison Company, as secretary; and Anthony Santilli, Lawrenceville Screw Company, as treasurer.

It is interesting to note that Mr. Logiodice initiated the first meeting of the Pittsburgh Chapter of the American Institute of Plant Engineers.

How To Prevent Fires in Cooling Towers

CONTRARY TO popular opinion, cooling towers do burn. While the hazard is obviously greater when the towers are out of service, many fires have occurred when they were in use.

To assist you in seeing that every possible precautionary measure is taken in preventing possible fires in cooling towers, the National Fire Protection Association has published a standard. The standard, purely advisory as far as the NFPA is concerned, is expected to be used widely as a guide by building inspectors, plant protection people and others who have to deal with this problem, and who, heretofore, have had no nationally-accepted guide to follow. The standard covers the location and construction of the towers, installation of the electrical equipment and methods of protecting the towers.

This standard, NFPA No. 214, is available from the National Fire Protection Association, 60 Batterymarch Street, Boston 10, Massachusetts, at 40 cents per copy.

Retirement—Promotion At Lever Brothers

Edgar F. Hanford recently retired from his duties as plant engineer at Lever Brothers Hammond, Indiana, plant. He became a member of the engineering staff at the Hammond plant soon after its construction in 1931, and on June 1, 1945, was promoted to the position of plant engineer. Hanford is a member of the Calumet Chapter of the American Institute of Plant Engineers.

James T. Snow has taken over the duties of plant engineer at this plant. He is a mechanical engineering graduate of the Massachusetts Institute of Technology and a registered professional engineer. He has served in various manufacturing capacities with Lever prior to becoming a project engineer in the New York office and later plant engineer at Cambridge, Massachusetts.

E. F. Hanford

J. T. Snow

Last year, while associated with the Boston Plant Engineers Club, a chapter of the American Institute of Plant Engineers, Snow served as chairman on the committee to revise and modernize the AIPE code.

Grinding Test Laboratory

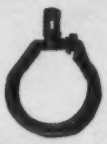
COMPLETION OF a new grinding test laboratory has just been announced by the Besly-Welles Corporation. The laboratory will be used to study customers' grinding problems under simulated production conditions.

Industrial plants wishing to take advantage of the facilities provided by the new laboratory may obtain further information from Besly-Welles Corporation, South Beloit, Illinois.

Grinnell offers you a complete line of pipe hangers and supports

HERE ARE 24 TYPICAL EXAMPLES . . .

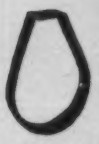
adj. swivel ring solid ring type fig. 101


adj. swivel ring split ring type fig. 104

split ring with socket fig. 107

split ring with turnbuckle adjuster fig. 115

adj. wrought ring fig. 97


adj. wrought ring fig. 269

wrought pipe clamp fig. 212

adj. wrought clevis fig. 260

extension pipe or riser clamp fig. 261

extension split clamp hanger fig. 139

light welded-steel bracket fig. 194

standard U-bolt fig. 137

CB-Universal concrete insert fig. 282

wedge type concrete insert fig. 281

adj. wrought beam attachment fig. 252

adj. swinging hanger flange fig. 155

one hole clamp fig. 126

G-Clamp hanger fig. 92, 93

C-Clamp figs. 83, 84 85, 86, 87, 88

malleable beam clamp with extension piece fig. 229

universal side I-Beam clamp fig. 225

single pipe roll fig. 171

adj. steel yoke pipe roll fig. 181

pipe roll complete fig. 271

Look this page over. Shown are some of Grinnell's pipe hangers and supports. In the *complete* line will be found a solution to *any* pipe suspension problem you may have.

The maximum recommended load ratings for hangers have been established by thorough testing in the Grinnell Research and Development Laboratories. They are based on a minimum safety factor of 5, or the allowable stresses specified in the ASA Code for Pressure Piping.

Many of Grinnell's hangers are listed by the Underwriters' Laboratories, Inc., and they are approved by the Factory Mutual Laboratories for use in fire protection systems. For any pipe suspension problem, look to Grinnell.

GRINNELL

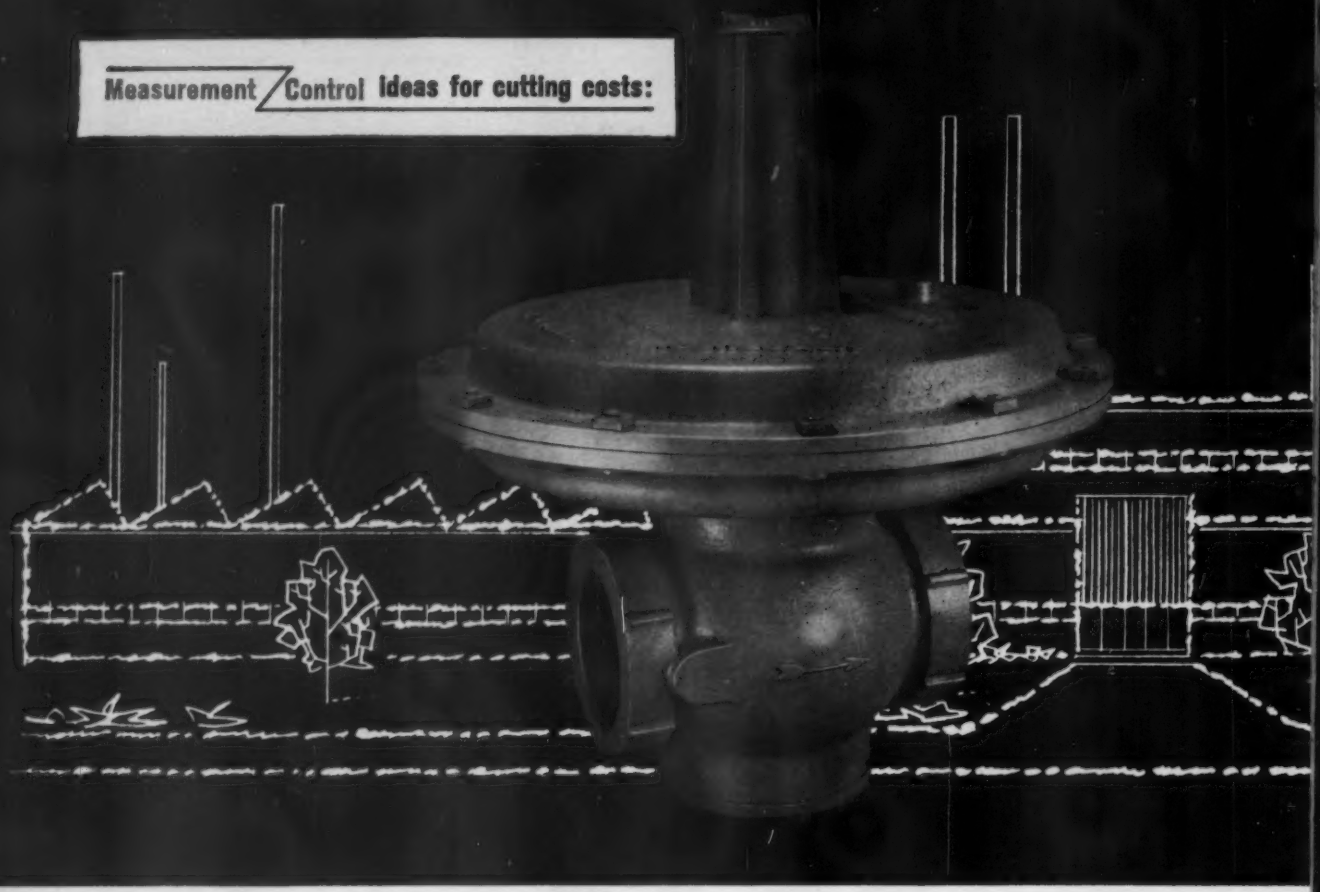
AMERICA'S #1 SUPPLIER OF PIPE HANGERS AND SUPPLIERS

Grinnell Company, Providence 1, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves
Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies
industrial supplies • Grinnell automatic fire protection systems • Amco air conditioning systems

For more facts circle 505 on Reply Card

Measurement / Control ideas for cutting costs:



The $40.00 regulator that could have saved $30,000.00

A gas pressure regulator like the one shown above was doing a precise job of regulating fuel gas in a glass plant—until a scaffold fell on it. Without the regulator, the entire plant was out of business. Down-time cost was about $30,000.00.

The Rockwell Field Engineer who personally rushed another regulator to this customer pointed out that an extra stand-by regulator would cost only $40.00—low-cost insurance against a possible $30,000.00 loss. The customer followed this recommendation, as well as others which the Field Engineer made in the interest of more efficient handling of measurement and control functions in this plant.

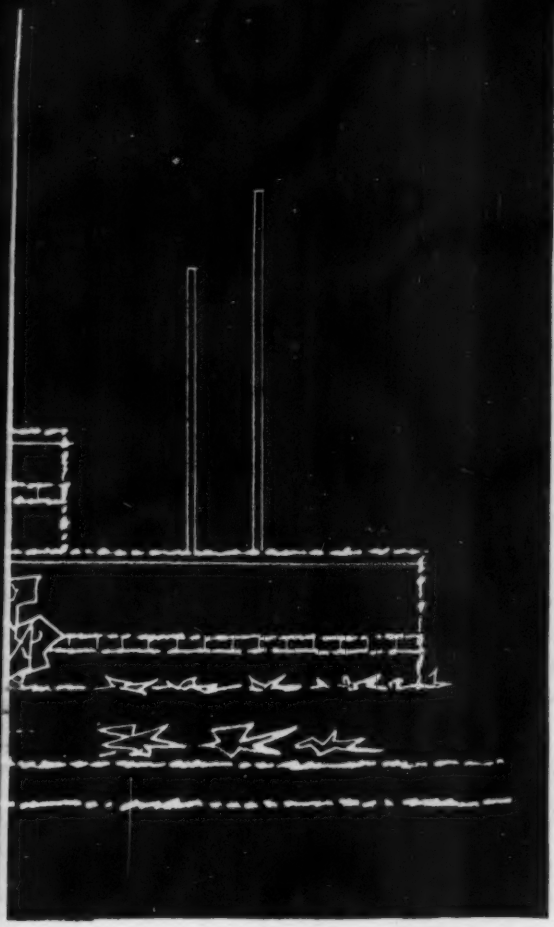
There are many ways a Rockwell Field Engineer can help *you* save time, money, and material wherever gases or liquids flow through pipe in your plant. He represents the largest and most experienced manufacturer of measurement and control products—and this experience can pay off for you. New or different uses of valves or regulators can prevent waste and inefficiency. Rockwell gas and liquid meters can measure almost anything that flows through a pipe, and can often assure big savings in time and labor, while improving quality.

It costs nothing to talk to a Rockwell Field Engineer—simply send the coupon.

ROCKWELL

The leading single source for Measurement / Control products and ideas

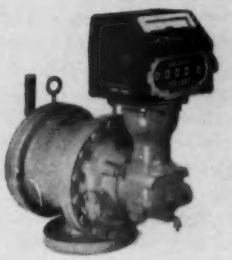
For more facts circle 506 on Reply Card



"IN-PLANT" METERING:

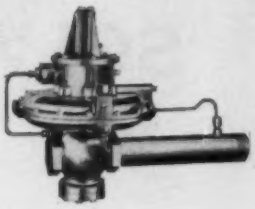
LIQUIDS AND GASES

"IN-PLANT" METERING can mean new cost cutting opportunities. Accurate liquid and gas meters are a positive way of improving cost control, insuring better use of materials, sharpening inventory control, and preventing waste. Whatever the need, Rockwell has the right liquid or gas meter to do the job better and at lower cost.

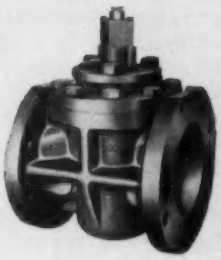


CONTROLLING PIPED MATERIAL:

LIQUIDS AND GASES



CONTROLLING PIPED MATERIAL more efficiently is a positive step towards cost cutting. Better valves can save wasted products and materials and often increase plant safety. Gas pressure regulators can cut costs by assuring safe, economical use of any gas used in the plant. Rockwell has the world's most complete line of flow control devices.



HOW MUCH COULD YOU SAVE?

There is hardly a plant of any kind—including yours—where the right application of the right measurement and control methods and equipment won't produce savings many times the modest cost involved. It will cost you nothing to have a Rockwell Field Engineer *show* you. Simply send the coupon below, now.

SEND COUPON NOW!

MEASUREMENT & CONTROL DEVICES

another fine product by

ROCKWELL

Rockwell Manufacturing Company, Pittsburgh 8, Pa. Dept. MC2H

☐ Please have a Rockwell Field Engineer call me for an appointment.

Please send literature on ☐ Controlling gas pressures; ☐ Valving gases, liquids and slurries; ☐ Measuring liquids; ☐ Measuring gases.

I am concerned primarily with ☐ Light & Heavy Metal Fabricating ☐ Basic Chemical Production ☐ Chemical Processing ☐ Food, Drugs & Tobacco ☐ General Manufacturing Operations ☐ Petroleum Processing

☐ Others: _____

Name: _____ Title: _____

Company: _____

Address: _____

City: _____ Zone: _____ State: _____

HELPFUL WATER CONDITIONING DATA FROM BETZ

SOLVING AN UNUSUAL CASE

■ Internal baffling must be in good condition for production of pure steam.

A LARGE paper plant had operated for many years utilizing steam generated by six 2 drum longitudinal, straight tube boilers. In 1947, one of these units was removed and a new 100,000 lb. per hour boiler, designated as Boiler No. 1, was installed.

During the latter part of 1955, 8 years after installation of the boiler, evidences of carryover of boiler water with the steam began to develop. Regulating valves operated erratically and stop valves failed to close completely or became inoperative. Examination revealed the accumulation of large quantities of sludge obviously deposited as a result of boiler water carryover. With the first indication of carryover, investigations of various factors which might contribute to this problem were conducted. Raw water and feedwater characteristics were checked and the boiler water treatment as well as chemical balances maintained in the boilers were reviewed. Periodic checks of steam purity indicated that a satisfactory degree of steam purity was being produced by the older boilers. However, Boiler No. 1, the newer boiler, indicated a high degree of carryover during these preliminary checks, with a solids content of the steam as high as 20 ppm.

Mechanical Factors

Since preliminary tests had indicated that Boiler No. 1 was the offender in the carryover problem, a study was started on this unit. Figure 1 indicates the measured steam purity at the start of this study on Boiler No. 1. For the purposes of contrast, a short section of this chart (3 o'clock position) is devoted to Boiler No. 2.

Figure 2 indicates steaming rates of Boiler No. 1 during this period.

An analysis of a boiler water sample indicated a dissolved solids content approximating 1,400 ppm with normal concentrations of alkalinity and phosphate present.

On the following day a sample of the condensed steam indicated a conductivity of 60 micromhos. Then, the water level was lowered until it was maintained at approximately two inches from the bottom of the glass. No change in conductivity was noted. After returning the water level to normal, the steaming rate on the unit was then decreased to 40,000 lb. per hour. The conductivity of the steam promptly decreased to 5.5 micromhos. In re-establishing the load on the boiler, certain fluctuations occurred in steam ratings which were promptly reflected in the conductivity recording. Typical variations in steam purity, coinciding with load variations, continued to be apparent after this portion of the test was concluded. At the time of these tests, the boiler water solids concentration varied between 1,500 and 2,000 ppm.

Chemical Factors

A comparison of steam conductivity values at the start of the test on Boiler No. 1 with those values obtained after solids concentrations were lowered to 1,000 ppm and held there consistently, indicated a reduction in contamination which was roughly proportional to the solids content of the boiler water as well as the load rating.

A suitable concentration of a specially-selected anti-foam agent was injected into Boiler No. 1 on the following morning, and thereafter added continuously in order to maintain the desired concentration of anti-foam in the boiler water. Subsequent results did not show any distinct improvement as a result of the addition of the anti-foam although some reduction in conductivity was obtained, approximating 5 to 10 micromhos.

Under ordinary circumstances, where carryover of boiler water with the steam is being caused by foaming or priming due to high suspended solids, high dissolved solids, high alkalinity or other similar chemical factors, the use of these special anti-foam agents would definitely have caused a considerable reduction in conductivity of the steam. The fact that no outstanding improvement in steam purity resulted after this treatment indicated that the basic cause of carryover was not chemical in nature.

Summary

The study up to this point had brought out the following facts:

There was no evidence of foaming or other carryover of boiler water with the steam caused by chemical factors at this time. The older boilers received the same feedwater and treatment and maintained the same chemical balances and solids concentrations in the boiler water as Boiler No. 1, indicating that a steam of satisfactory characteristics was produced at all times.

The application of a proper anti-foam had no appreciable effect upon the steam purity. A pronounced effect would have been encountered if carryover had been due to chemical causes induced by high suspended solids, high alkalinity or high dissolved solids.

Reduction of water level had no bearing on the steam purity. Conversely, the

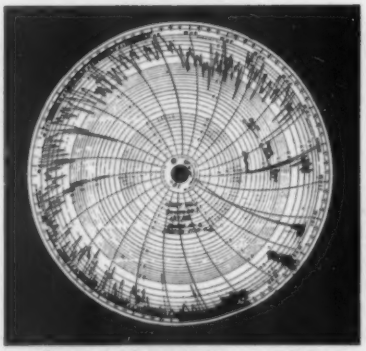


Figure 1—Record of steam purity, Boiler No. 1

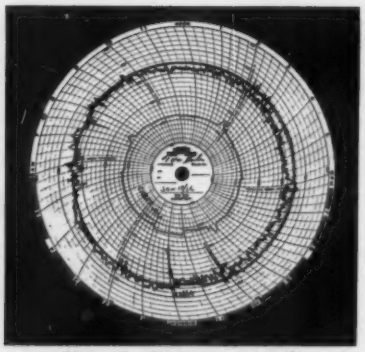


Figure 2—Steaming rates of Boiler No. 1

baffling in the boiler normally should permit a considerable variation in water level with the production of pure steam.

A reduction in the boiler rating caused a direct and definitely quantitative reduction in solids content of the steam. This effect was so remarkably consistent that for any set of conditions, the boiler rating could be estimated rather accurately from an inspection of the steam conductivity chart.

A reduction of the solids content of the boiler water from 2,000 ppm dissolved solids to 1,000 ppm dissolved solids caused a distinct reduction in the solids content of the steam approximating half of the original values.

The nearly quantitative variations in steam conductivity corresponding to variations in steam rating and boiler water dissolved solids concentrations indicated that the difficulty with Boiler No. 1 was being caused by leakage of moisture past the internal baffles and screens.

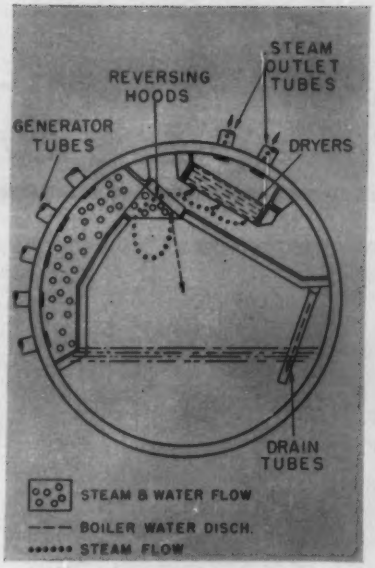


Figure 3—Cross-sectional detail, with drying arrangements in boiler drum.

be cleaned with inhibited acid. Also, with the reassembly of the baffling, the separation noted in the steam dryer bank would be corrected.

Two weeks after the study was completed, the boiler was thoroughly acid cleaned and the internals rebuilt. When the boiler was placed on line, frequent spot checks indicated an uncorrected conductivity of 4 and 5 micromhos for the steam at 90,000 lb. per hour rating and boiler water dissolved solids concentrations between 1,500 and 2,000 ppm. The uncorrected value of 4-5 micromhos is equivalent to a corrected conductivity of approximately 1.0 micromhos, equal to 0.5 ppm dissolved solids in the steam. The present value of 0.5 ppm solids contrasts considerably with the values of 30 ppm and higher at the beginning of the study.

On the basis of the results obtained, it is obvious that the regasketing and acid-wash operations were carried out with complete success.

OF CARRYOVER

Boiler Inspection

Boiler No. 1 was inspected for the primary purpose of determining whether or not any disarrangement of the steam separating internals might be the cause of the carryover condition. Figure 3 illustrates the cross-section details of the baffling installed in Boiler No. 1.

Several slight cracks were found in a small number of the reversing hoods and four openings (varying in diameter from ¼″ to ½″)—resulting from a poor fit between the end plates of the steam baffling and the protective shields around the safety valve nozzles. It was also noted that the gasketing inserted in the bolted joint between the end plates and the rigid supports attached to the drum itself was in very poor condition. One section gave distinct evidence, by the deposition of boiler water solids, that some boiler water had by-passed the steam baffling.

Removal of certain portions of the baffling permitted an inspection of the entire bank of dryers. In approximately the center of the boiler, a separation in the shape of an elongated triangle, approximately 2″ wide at the base, was found to exist in the center of the steam dryer bank.

Close attention was given, during the inspection, to the possibility of any sludge accumulations in the baffling, reversing hoods or in the drain lines from the dryers which might possibly interfere with the efficiency of such equipment and thus cause the carryover condition. No such accumulations were noted at any point which might possibly have contributed to the problem.

Recommendations

Production schedules did not permit dismantling of the separator for complete repairs. Correction of the apparent leaks were made initially and the boiler was returned to service. A recheck of the steam purity indicated substantial improvement, but complete correction of the problem did not result from the partial repairs. It was apparent on the basis of these tests that further corrective measures were necessary. It was felt that these measures should include a complete dismantling of the internal baffling and reassembling, using new gasket material. In order to obtain the maximum benefit from the regasketing, and to provide the boiler with the first complete cleaning in 8 years of operation, it was recommended that the boiler

Conclusions

The experiences of this study are not to be considered as a reflection upon the equipment manufacturer. Rather, they point up the necessity of periodic checks on steam purity as a basic requirement of good operating practices.

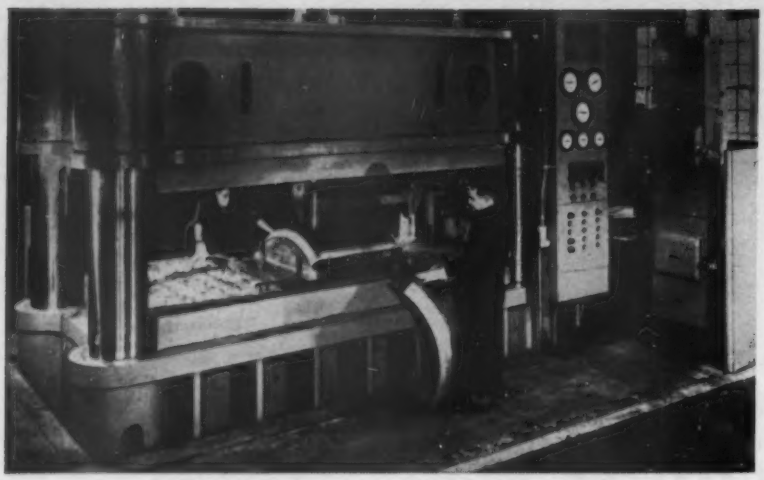
A *complete* water service program should include close checks on steam purity by an organization with wide experience in the solution of such problems.

The case of carryover discussed here is only one of many unusual problems solved by BETZ LABORATORIES. If you have an unusual industrial water problem—*any* problem, large or small—why not call in a Betz Field Engineer for a helpful discussion? A good time to do it is *now!*

BETZ LABORATORIES, INC.
Gillingham & Worth Streets • Phila. 24, Pa.

■ CONSULTANTS ON INDUSTRIAL WATER PROBLEMS

Lubrication



PREMIUM HYDRAULIC OILS CAN MORE THAN PAY BACK THEIR INITIAL EXTRA COST

Laboratory experiments, exhaustive field tests and, finally, general industrial experience have conclusively proved the long-term economy of a premium hydraulic oil over even the best straight mineral oil.

What makes a premium oil different? Straight mineral oil is a highly refined product containing many good lubricating qualities. However, it may be subject to fairly rapid oxidation, and it foams persistently when agitated.

On the other hand, a premium hydraulic oil, like Texaco Regal Oil R&O, contains a number of additives specifically designed to minimize or eliminate the undesirable qualities of straight mineral oil, while retaining the good.

Importance of these qualities in a hydraulic system. Oxidation, rust and foam all breed trouble in hydraulic sytems, even though they may not be immediately apparent. Because Regal Oil R&O is specifically inhibited to guard against these dangers, you can expect four distinct areas of savings, in spite of higher initial cost, when you install this premium oil in your hydraulic equipment:

It saves man-hours. Because a premimum hydraulic oil is inhibited against oxidation and rust, it will not form sludge in the system or allow parts to corrode. This can more than double the intervals between scheduled overhauls, saving valuable maintenance man-hours.

It prevents production losses. By keeping hydraulic systems clean, Regal Oil R&O guards against those sudden, unexpected stoppages that halt production, are costly to overcome. Pumps and other parts last much longer, too.

It cuts rejects when used in production equipment. Regal Oil R&O is inhibited against foaming. And foam, which causes jerky operation, can be a large factor in ruined machine parts.

It reduces oil drains. Because Regal Oil R&O lasts longer than straight mineral oil, systems don't have to be refilled nearly so often. The savings on this one factor alone are often enough to counterbalance the higher initial cost of Regal Oil R&O.

Way found to coat steel concrete forms without wasting oil

How to coat steel concrete forms without wasting a large amount of the oil in run-off has always been a problem for manufacturers of concrete products.

One of the country's leading concrete pipe producers has now licked this problem by using a 50-50 mixture of diesel fuel and Texaco Stazon. Originally developed as a non drip product for textile mills, this unique Texaco lubricant clings just as well to steel forms. The pipe manufacturer reports that run-off has now been eliminated completely. The new mixture can be used in temperatures as low as 0°F and can be either sprayed or painted on the forms.

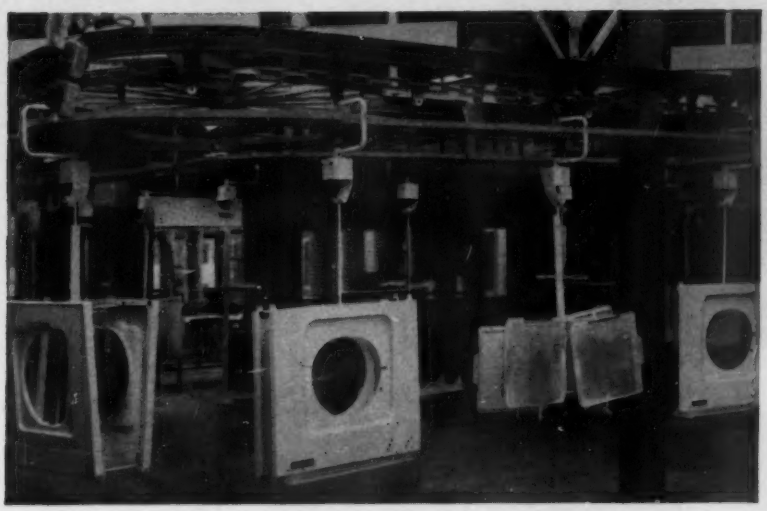
MOVIE OF THE MONTH

SEE...

"Shear Magic"

Texaco's new full-color film on the nature and uses of grease is a must-see feature for anyone interested in getting the most out of grease-lubricated equipment.

news



How manufacturer eliminated rejects caused by flaking conveyor

Flakes of rust dropping from the plant-wide conveyor system onto newly painted finishes were causing an unhealthy 10% reject rate for one manufacturer of large household appliances. His problem: the conveyor traveled through areas where the humidity was high, as well as through baking ovens. These widely varying heat and moisture conditions were too much for the conveyor finish.

Texaco called in. Although the problem was not directly associated with lubrication, the visiting Texaco Lubrication Engineer heard about it and recommended having the conveyor sprayed with Texaco Rustproof Compound L. This versatile Texaco product withstood both the excessive humidity and the high temperatures that the conveyor encountered in its travels around the plant. Rusting ceased and rejects of the finished product dropped drastically from 10% to a normal 1½%.

New Seagram building gets cutting oil bath

In one of the most unusual uses for a petroleum product yet, the Seagram building, on New York's Park Avenue, recently employed Texaco Sultex Cutting Oil as a bath for its unique bronze facade. The reason: a dark "antique" surface on the metal was wanted, and the sulphur in Sultex reacted nicely with the bronze to give the desired effect of age!

For more facts circle 508 on Reply Card

NEW PRODUCT NEWS

New tool joint compound resists pressure used in joining pipes, and joints can be broken without using much more torque than was applied in making them up. Primarily for use in oil fields. Makes an excellent thread lubricant anywhere where cost is a big consideration.

Lube facts to be aired for metal-working plants

The story of many of the less common, "odds and ends" lubricants used in metalworking will be told in the July issue of "Lubrication" magazine. The editors plan to discuss roll oils (both ferrous and non-ferrous), lubricants for hot punching, deep press drawing, wire drawing and the like. To be sure you're on the list to get this important issue, mail coupon.

Clip Coupon To Company Letterhead

TEXACO INC., Dept. E-LN-21
135 East 42nd Street
New York 17, N. Y.

Dear Sirs:

☐ I am interested in seeing "Shear Magic".

I would like a free copy of

☐ Lubrication Magazine

☐ Management Practices that Control Costs via Organized Lubrication.

Name _____ Title _____

Firm _____

Address _____

City _____ State _____

When it's unit heaters . . .

When you want unit heaters you don't have to look far afield . . . or even look *over* the field. All you need do is look to Ilg. For *only* Ilg has everything you need in the way of unit heaters.

No matter what source of heat you prefer—gas-fired,

Only ILG *gives you*

Gas-Fired Unit Heaters. Ilg Model 35M—now the smallest and lightest 35,000 Btu./hr. input model on the market. Only 18" high, 14" wide, 66 pounds in weight. Complete line includes ten basic models from 25,000 to 250,000 Btu./hr. input. For use with natural, manufactured, mixed and liquefied petroleum gases.

All-Electric Unit Heaters. Pick any capacity from 1½ to 36 kw. and Ilg will furnish the unit you need. All heaters have non-glowing, steel sheathed heating elements . . . super-quiet aluminum fan wheel . . . permanently lubricated motor . . . built-in protection against overheating. All parts fully protected by Ilg's famous "One-Name-Plate" guarantee.

For unit heaters built to satisfy your "specs"...

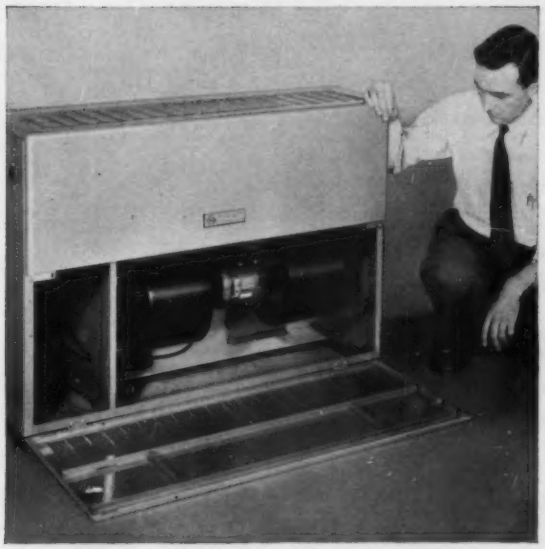
you're in clover when you look to ILG

all-electric, steam or hot water—Ilg has the unit to meet your demand, in a variety of types and sizes.

So why shop around? Put all unit heater responsibility on Ilg—the *only single source* that has all four types of heaters—and you eliminate heater headaches.

For further details, write for Bulletin 808 on electric heaters, Bulletin 357 on horizontal and vertical heaters, Bulletin 286 on gas-fired heaters, Bulletin 1306 on cabinet heaters.

all four types of unit heaters



Steam and Hot Water Cabinet Heaters. Seven basic sizes; 21 hot water ratings; 14 steam ratings. Heavy-gauge steel casing. Choice of blow-through type with direct-drive fan assembly or draw-through type with belt-driven fan. Available for floor, ceiling, wall or inverted mounting; non-recessed, semi-recessed, fully recessed, or concealed installation.

Steam and Hot Water Horizontal and Vertical Heaters. *Horizontal* models in 19 capacities. Heating coils are rounded copper tubes hydraulically expanded for tight bonding to aluminum fins; totally enclosed motors. *Vertical* models in 15 capacities; two types—for standard and low outlet air temperatures. Coil construction similar to horizontal heaters.

specify ILG

ILG ELECTRIC VENTILATING COMPANY
2832 N. Pulaski Road, Chicago 41, Illinois
Offices in 57 Principal Cities
Member of Air Moving and Conditioning Association, Inc. (AMCA)

For more facts circle 509 on Reply Card

"Here at AMERICAN CAN we're package

"Ours is a specialist's approach to packaging. It's been our business for 58 years, and we've built a reputation for knowing what it takes to design and produce a package that moves goods.

"It's the same with our OTIS Freight Elevators. We have 154 of them in 75 AMERICAN CAN COMPANY plants across the United States. They're a vital part of our production facilities that turn out millions of packages a day.

"As specialists, we knew from the start that the OTIS specialist's approach to Elevator Maintenance was the right way to assure continuous production."

What is the OTIS *specialist's approach* to elevator maintenance?
It is MEN . . . MATERIALS . . . METHODS.

MEN: Elevator maintenance is no one-man job. It is an organization task requiring experts in many lines. No individual, even if he devoted his entire time to the job, could do it properly. It calls for men with an unusual combination of skills plus long training in studying parts, assemblies, functions, replacement procedures, testing and adjusting. Some degree of elevator complexity can be gleaned from the illustration at the right.

MATERIALS: Original OTIS parts and specially designed OTIS maintenance equipment are within one hour of 90% of all OTIS elevators in the U. S. for use in scheduled replacements—and to hold emergency shutdowns to a minimum.

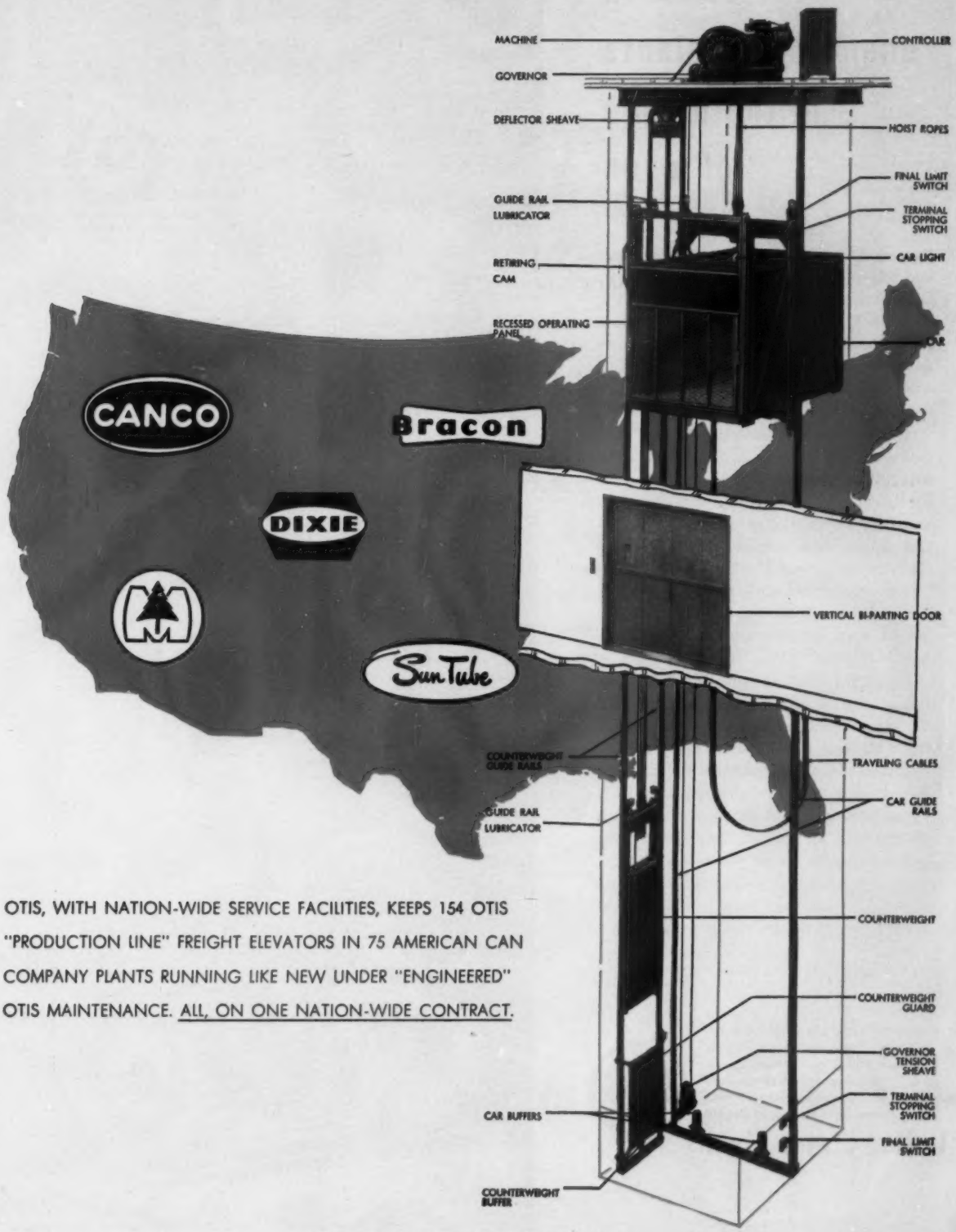
METHODS: With more than 40,000 elevators under OTIS maintenance, OTIS has developed an actuarial procedure that replaces wearing parts well in advance of their breakdown point to hold shutdowns to an absolute minimum and assure the highest possible safety.

freight elevator maintenance

ASSURES CONTINUOUS PRODUCTION

OTIS ELEVATOR COMPANY • 260 ELEVENTH AVENUE • NEW YORK 1, N.Y.
OFFICES IN 297 CITIES ACROSS THE UNITED STATES AND CANADA

men . . . not elevator maintenance men"



OTIS, WITH NATION-WIDE SERVICE FACILITIES, KEEPS 154 OTIS "PRODUCTION LINE" FREIGHT ELEVATORS IN 75 AMERICAN CAN COMPANY PLANTS RUNNING LIKE NEW UNDER "ENGINEERED" OTIS MAINTENANCE. ALL, ON ONE NATION-WIDE CONTRACT.

For more Facts circle 510 on Reply Card

How to change your plants in the middle of a run

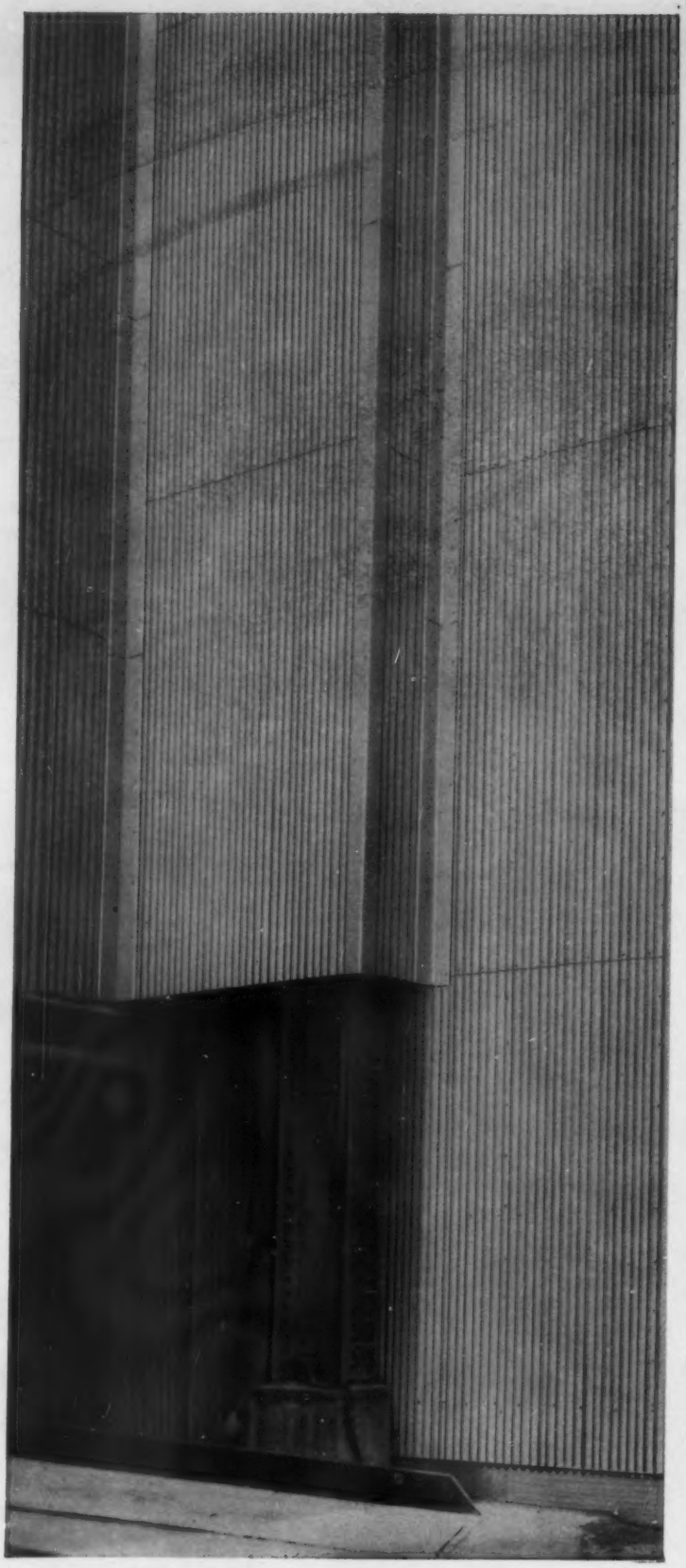
Owens-Corning Fiberglas Corporation had to replace their old plant in Newark, Ohio, but they didn't want to shut down to build a new one. So they built a new shell *around* the old plant. Production never stopped, and when the new building was completed they dismantled the old one and carried it out the door.

The builder applied the new roof and side walls of USS Galvanized Steel Sheets using Fiberglas-reinforced plastic panels for lighting. Both these materials are light and easy to handle, so construction time and labor were reduced. Because USS Galvanized Steel Roofing and Siding Sheets are exceptionally strong and corrosion resistant, there's practically no danger of wind or weather damage to the new building.

Inside the plant are some of the largest furnaces in the world for melting glass. They operate at temperatures over 2,000°F. Here was another reason for the selection of Galvanized Steel Roofing and Siding—it is more fire resistant than other types of roofing and siding and it retains its strength at temperatures that ignite, soften or distort other materials.

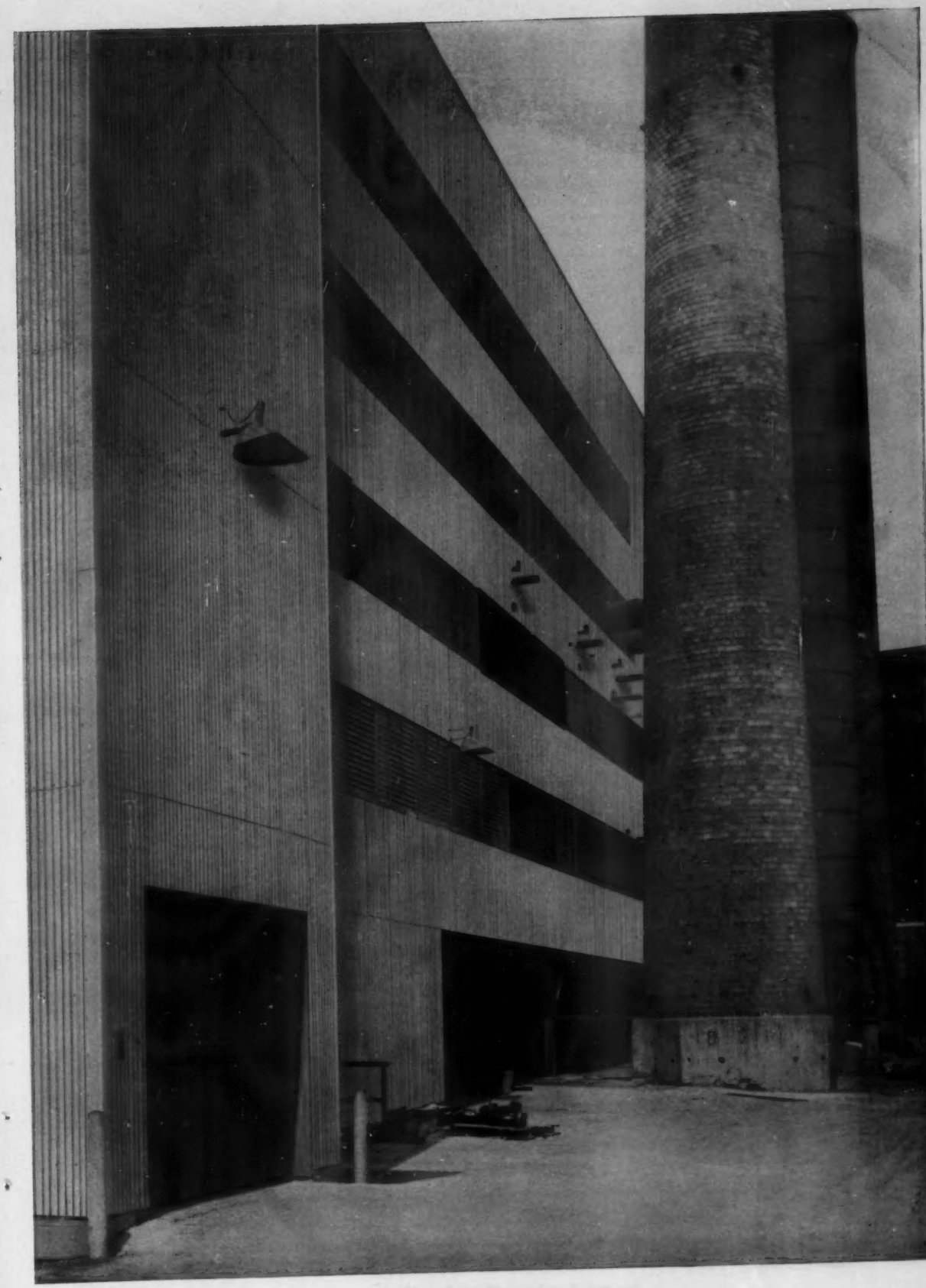
Specify USS Galvanized Steel Roofing and Siding for your next re-roofing program or plant maintenance project.

USS is a registered trademark
Fiberglas is the registered trademark of Owens-Corning.



United States Steel Corporation—Pittsburgh
Columbia-Geneva Steel—San Francisco
Tennessee Coal & Iron—Fairfield, Alabama
American Steel & Wire—Cleveland
United States Steel Supply—Steel Service Centers
United States Steel Export Company

United States Steel



Here's Quick, Permanent Solution To Many Plant Construction Problems:

ARMCO CORRUGATED METAL STRUCTURES

Meeting the basic need of underground structures for plant operations can have many answers. But for fast construction, dollar savings, permanence and a minimum of maintenance, you'll find Armco Corrugated Metal Structures provide the *best* answer. Look how you can use them.

UNDERPASSES

Big, sturdy Armco MULTI-PLATE® Structures, available in a variety of sizes, shapes and gages, are an economical tool for the design and construction of underpasses and similar structures where you need clearance for trucks and other big vehicles. Many serve as grade separations between plant traffic and public or private thoroughfares.

UTILITY AND PEDESTRIAN TUNNELS

Tunneling is often the best answer for installing conduits, pedestrian underpasses and similar structures under existing facilities. When you tunnel, you save the surface. When you tunnel, do it quickly and safely with Armco Liner Plate. Pound for pound, it's the strongest tunnel liner plate made.

SEWERS AND CONDUITS

For sewers, conduits, culverts—practically any drainage need—specify Armco Pipe to meet your exact requirements, from size to service conditions. Long lengths help speed installation, keep costs down.

WRITE FOR FREE LITERATURE

Tell us about your specific drainage and construction plans. Armco Drainage & Metal Products, Inc., 4819 Curtis Street, Middletown, Ohio.

ARMCO DRAINAGE & METAL PRODUCTS

Subsidiary of ARMCO STEEL CORPORATION

OTHER SUBSIDIARIES AND DIVISIONS: Armco Division • Sheffield Division • The National Supply Company
The Armco International Corporation • Union Wire Rope Corporation • Southwest Steel Products

For more facts circle 512 on Reply Card

LINK-BELT GEARMOTORS . . .

cool-running!
quiet!
compact!

Where inches count . . .
LINK-BELT Gearmotors
make the most of mounting space

If you're after (1) high-efficiency speed reduction (2) performed in close quarters—look no longer. You get the best of both with Link-Belt Gearmotors.

• COOL-RUNNING—due to precision-cut, hardened gear trains that minimize friction.

• QUIET—a result of smooth-meshing gears and cast-iron, one-piece housing.

• COMPACT—because of simple gear trains and flange-connected motor that requires no additional coupling devices.

Available in double, triple and quadruple reductions—ratios from 6.2:1 to 985:1 . . . up to 100 hp.

FOR FULL-LINE FACTS

on Link-Belt's comprehensive line of speed reducers—contact your nearest Link-Belt office or authorized stock-carrying distributor . . . or check and send this coupon to Link-Belt Company for data on all or any combination of the following:

- [x] gearmotors—Catalog 2747
- [ ] motogears—Catalog 2747
- [ ] helical gear speed reducers—Catalog 2751
- [ ] shaft-mounted speed reducers—Catalog 2618
- [ ] worm gear speed reducers—Catalog 2324-A
- [ ] universal worm gear speed reducers—Catalog 2724
- [ ] parallel shaft speed reducers—Catalog 2619
- [ ] fluid drives—Catalog 2747
- [ ] P.I.V. speed changers—Catalog 2274

LINK-BELT

PRUDENTIAL PLAZA, CHICAGO 1, ILL.

15,112

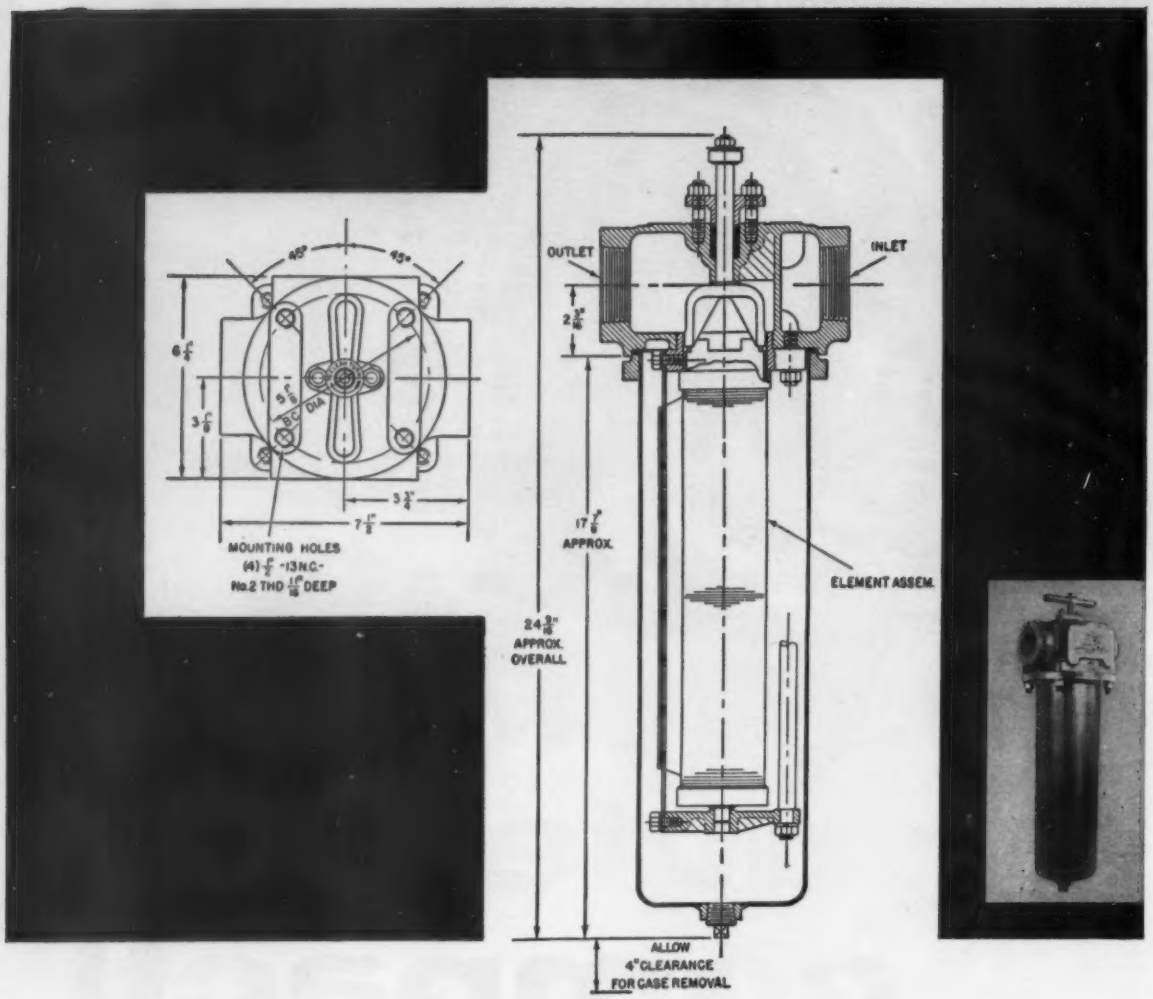
NAME_____

FIRM_____

ADDRESS_____

CITY_____ ZONE___ STATE_____

For more facts circle 513 on Reply Card



This one standard Purolator filter is

EXACTLY RIGHT *for all these fluids:*

inks • paints • varnishes • food products • greases • process fluids • fuel and lube oils

SPECIFICATIONS: This Purolator filter model G-141J—is designed for filtration in a range upward of 40 microns.

It can be installed on pressure or suction side of pump.

It is recommended for capacities of from 6 to 200 GPM, dependent on viscosity. Spacing varies from .0010 to .020.

Relief valves set from 10-12 (generally 15 to 20) to 50 PSI are incorporated in several models.

Motor driven knife blade to clean element can be furnished whenever conditions make manual rotation impractical.

Maximum pressure: 125 PSI; weight: 37 lbs. Equipped with simplex full-flow metal element oil strainers.

Available in all stainless steel construction for corrosive liquids, process fluids, food products.

If this filter's specifications recommend it for a problem of yours, write for application information.

Filtration For Every Known Fluid

PUROLATOR

PRODUCTS, INC.

RAHWAY, NEW JERSEY AND TORONTO, ONTARIO, CANADA

For more facts circle 514 on Reply Card

BULLETINS just released and of immediate plant interest

Postage-free Reader Service Cards make it easy to order catalogs. Cards are provided on pages 209 and 210.

VALVES, PIPING, FITTINGS

101 Ductile Iron Valves—Strength, corrosion resistance, other advantages of ductile iron valves are detailed in this 8-pp bulletin. Properties and characteristics of ductile iron are given. Also provided is information on valve types and sizes available in this metal and suggested applications. Walworth Co.

102 Designed for Ductile Iron—Introduced in 8-pp Form 1010 is the Pipe-Pal line of gate valves designed specifically for ductile iron. In addition to listing specifications, pressure-temperature ratings, and dimension and material charts, it describes new applications and includes discussion of engineering properties of ductile iron and micro-structure comparisons with gray iron. The Ohio Injector Co.

103 Improved Plug Valves—Design features and performance advantages of company's non-lubricated, bearing mounted plug valves are detailed in 20-pp Catalog V-58. Illustrated explanation of valves' operation, dimensional data and diagrams are included. Hydril Co.

104 Diaphragm Control Valve—Eight-pp Bulletin J-170 describes sliding gate diaphragm control valves designed for accurate control of pressure temperature liquid level. Includes engineering data, cutaway drawings, application information, dimensional drawings, rating charts, flow curve. OPW-Jordan.

105 Butterfly Valves—Bulletin 583 includes a table listing allowable pressure drop for company's metal-seated wafer butterfly valves. Construction features, methods of control are described and dimensional diagrams included. W. S. Rockwell Co.

106 Coated Valves—Eight-pp Bulletin V-614 describes coated lubricated plug valves which provide chemical resistance to both inorganic and organic agents. Includes description of coating properties, tables of recommended applications and photo-illustrations of installations. Rockwell Mfg. Co.

107 Tempered Glass Pipe—Detailed information on tempered industrial glass pipe and fittings is presented in this 16-pp bulletin. Dimensional diagrams are included, as well as tables listing sizes, and a section of technical data. Owens-Illinois Glass Co.

108 Teflon Molded Shapes—Bellows, flexible couplings and expansion joints made of Teflon are described in Bulletin A-56-1. Pressure-temperature charts, and detailed specification and dimensional data given. John L. Dore, Co.

109 Pipe Repair Coupling—Featured in this ring-bound product catalog is a pipeline coupling used for connecting replacement sections into an existing pipeline. Installation details are included, also photos and diagrams of the coupling. The Pipe Line Development Co.

PUMPS, COMPRESSORS

110 Rotary Pumps—Internal gear rotary pumps for handling hazardous liquids are illustrated and described in this product bulletin. Performance chart is included, as well as dimensional tables and diagrams. The Wayne Pump Co.

111 Vertical Turbine Pump—Featured in 16-pp Bulletin 2400-B1 is a line of ultra high flow vertical turbine pumps. Design improvements, which result in broader coverage and higher efficiencies over wider operating ranges, are illustrated and described. Worthington Corp.

112 Submersible Sump Pump—Eight-pp Bulletin 5300 describes features and operation of a submersible sump pump which can be lowered into a sump pit for temporary service or permanently installed for continuous service. Performance and dimension tables included. The Deming Co.

113 Free Flowing Pumps—Bulletin P10-B44 describes features and varied materials handling applications of company's Torque-Flow pump. Applications in the coal, pulp and paper, and chemical industries are used to show how the design principles of this pump makes it non-clogging, abrasion resistant, yet gentle enough for delicate materials. Western Machinery Co.

114 Refining Industry Pumps—Sixteen-pp Catalog R-59 describes pumps designed for the refining and petrochemical industries. Design features are illustrated through cutaway views, and selection tables giving essential data are included. Wilson-Snyder Works, United States Steel.

115 Heavy-Duty Compressors—Twelve-pp Bulletin A-73 covers heavy-duty industrial air compressors, providing specifications and dimensions for six basic models from 350 to 1250 hp, 2418 to 7392 cfm. Semi-radial design features are shown in a large cross-section drawing. Installation photos point up compactness of the rugged compressor. Joy Mfg. Co.

116 Air-Cooled Compressors—Sixteen-pp Bulletin A-56 illustrates and describes a line of aircooled compressors for a variety of applications in industry. Cross-section drawings and a complete run-down on all components included. Joy Mfg. Co.

PACKINGS, GASKETS, SEALS

117 O-Ring Packings—Physical and mechanical consideration of O-Ring selection are outlined in this 20-pp bulletin. Engineering data and reference tables simplify selection, installation, lubrication and maintenance. It also covers materials, machining. The Auburn Mfg. Co.

118 Rugged Gasketing—How you can reduce gasketing costs by using Armalon (TFE-fluorocarbon impregnated felt) is told in this bulletin. Gives data on characteristics of Armalon; lists specific applications where it performs to best advantage; provides seven case histories on service performance of Armalon gaskets, under extreme conditions; and includes information on sizes, thicknesses available. Fabrics Div., E. I. du Pont de Nemours & Co. (Inc.)

119 Molded Cups—Latest types of molded cups for pump pistons, hydraulic service and for pneumatic equipment are described in Bulletin AD-145. Details construction, recommended service, available sizes. The Garlock Packing Co.

120 Deep Convolution Seals—Twenty-pp Bulletin BF200-3 presents a basic description of the Bellofram seal along with typical applications and uses as well as typical installation drawings, methods of attachment, installation techniques and standard dimensions. Tabulates construction materials of standard elastomer compounds as well as standard and non-standard fabrics, includes engineering data. Bellofram Corp.

ELECTRICAL

121 Substation Transformers—Bulletin GEA-5452A, 8-pp, describes Powermaster substation transformers rated single-phase, 500 kva and below, 15 kv and below, for use in distribution and industrial substations. Shows exterior and interior features and tells how these transformers can increase kva capacity of mounting pads and reduce operating, maintenance costs. General Electric Co.

122 Voltage Regulators—Application, description, selection, weights, dimensions and connection diagrams are given in 60-pp Bulletin GEC-1450A describing company's dry type and liquid filled voltage regulators. Facts about voltage and importance of proper voltage control are covered, and photos and diagrams are included. General Electric Co.

123 Rubber Power Cable—This 32-pp catalog contains detailed information on design features, insulations, and performance highlights of

BULLETINS

(Begins on page 21)

butyl rubber power cable. Includes data on available constructions, ampacity and installation data. Anaconda Wire & Cable Co.

124 Wiring System Standards—Informative data on wiring and wiring system standards is in Technical Bulletin RCT-102. It features sections on automation, conduit systems, troughs, trays, ladders, bus ducts and other products and wiring methods. Includes recent bibliography on subject. Rome Cable Corp.

New Booklets on Batteries

125 Protecting Battery Investment—Detailed instruction on motive-power battery installation and maintenance are given in 20-pp Form 1982. Included are recommendations on storage procedures and routine repairs, as well as checklists of spare parts and tools. This book serves as a refresher in battery and charging station procedures and is illustrated throughout with charts, photos and drawings. General rules of maintenance covered. Also included are tips on keeping batteries at peak form. Exide Industrial Div., The Electric Storage Battery Co.

126 On Motive Power Batteries—This 48-pp general service manual details operation, maintenance, charging, trouble-shooting, and repair of motive power batteries. Profusely illustrated with photos, diagrams, tables, and charts, the manual covers basic theory and operating principles and explains charging methods. Charging practices discussed include boost charges, manual charging, modified constant voltage charging and two-rate method. Step-by-step instructions show how to make battery repairs. C & D Batteries, Inc.

127 Industrial Truck Batteries—Eight-pp Form 6203 describes storage batteries which can be used interchangeably in more than one size of truck. Photos, sketches and text detail design and construction features. Exide Industrial Div., The Electric Storage Battery Co.

128 Storage Batteries—Facts about storage batteries are presented in this 32-pp booklet. Describes electrical system, battery chemistry and battery construction, and includes tips on battery care, maintenance and selection. Exide Automotive Div., The Electric Storage Battery Co.

LIGHTING

129 Industrial Lighting Data—New specifications for incandescent and mercury vapor uplight porcelain enamel and aluminum high mounting units, "all-white" incandescent specs and many upward revisions in specifications for industrial fluorescent fixtures are included in 44-pp 1959 edition RLM Specifications Book. Contains complete specifications for 14 basic types of most widely specified industrial lighting units. RIM Standards Institute, Inc.

130 Portable Lamps—Applications for fluorescent portable lamps in a variety of industries are illustrated and described in this series of product bulletins. Specifications and price data given. Day-Ray Products, Inc.

MECHANICAL POWER TRANSMISSION

132 Power Transmission Products—Catalog 759 contains 104-pp of engineering data, specifications and prices on roller chain, sprockets, couplings and conveyor chain. Data includes material on selection of roller chain drives, speed ratios for sprocket combinations, chain length tables, illustrations of various standard attachments, and technical specifications. Diamond Chain Co., Inc.

133 Variable-Speed Drive—Eight-pp Bulletin 195 describes features and applications of company's variable-speed drives. Includes detailed information on horsepower, duty, speed variation, mounting styles, enclosures, and electrical characteristics. Sterling Electric Motors, Inc.

134 For Flow Control—Eight-pp Bulletin A519 describes application of Gyrol fluid drives to pipeline pumping stations. Outlines advantages of the adjustable speed units. Operating principles are illustrated with schematic section drawing of a typical unit. Curves chart economy of this drive vs constant speed drive with throttling control of flow. Line characteristics and pump characteristic brake horsepower and pressure curves provided. Industrial Div., American-Standard.

135 Worm Gear Sets—Basic data needed for accurate selection of worm gear sets is provided in 24-pp Catalog 3800. Illustrated with explanatory drawings, it contains basic information on worm gearing as well as selection tips, design data, calculation of bearing loads. De Laval Steam Turbine Co.

136 Gearmotor Guide—Featured in 18-pp Bulletin 5806 is detailed selection and application information on company's all-motor and integral type gearmotors. Application classification tables, selection tables, conversion table, sprocket diameters, load capacity table, and dimensional data provided. Western Gear Corp.

137 Adjustable-Speed Drive—Eight-pp Bulletin K-250 discusses adjustable speed and drive control problems. Describes typical applications along with methods and types of remote and automatic control, plus variable speed bedplate assemblies. The Cleveland Worm & Gear Co.

138 Drives for Calenders—Eight-pp Bulletin GEA-6910 describes a line of adjustable-speed drive equipment for calenders. Advantages are detailed and selection table listing important features is included. General Electric Co.

MATERIALS HANDLING

139 Overhead Handling—Engineering and application data on overhead handling equipment is presented in 12-pp Booklet 2008-O. Covers various types of carriers, cranes, tractors, track switches, grabs, electrification, and includes detailed studies of track design, peening and stresses. The Cleveland Tramrail Div., The Cleveland Crane & Engineering Co.

140 Monorail, Crane Selection—Factors to consider in planning and selecting an overhead material handling system are detailed in this 52-pp catalog on monorail and crane equipment. Applications in various industries—automotive, ceramic, chemical, metalworking, food processing, paper, textile etc.—are illustrated and described as to advantages afforded. The Louden Machinery Co.

141 Conveyor Equipment—Catalog A-101 is a 48-pp guide to company's conveyor equipment, including gravity wheel, wheel rail, gravity and live roller, slat and chain, portable belt, horizontal belt, and floor to floor conveyors. Descriptions, photos and technical information included. Sage Equipment Co., Inc.

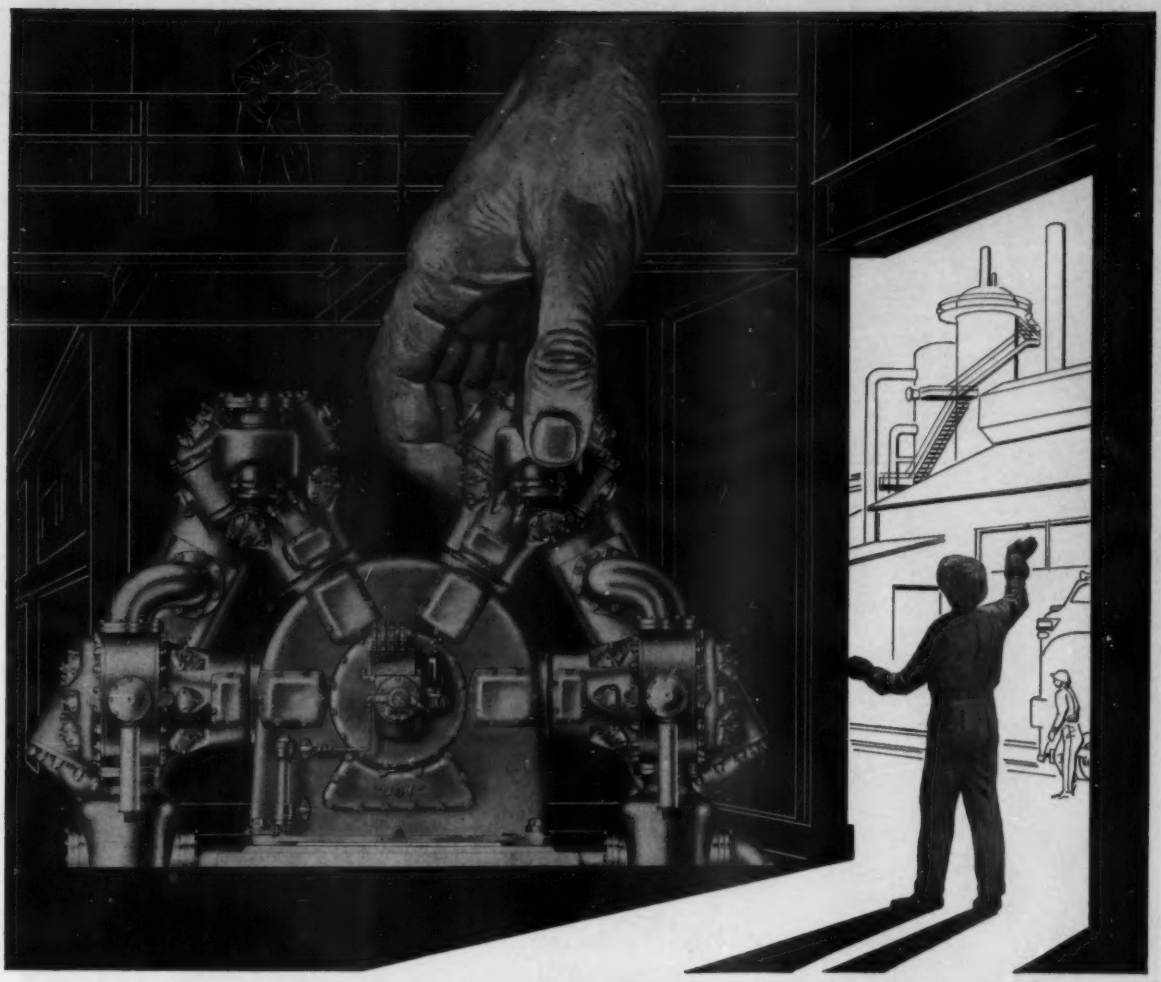
On pages 209-210 are two postage-free Reader Service Cards provided for your convenience in ordering these bulletins. You may also use the cards to order any literature mentioned in ads.

142 Pressure-Sensing Conveyor—Design and performance features of company's pressure-sensing conveyor are illustrated and described in 8-pp Bulletin A-P-C-59. Specifications, cutaway photos included. The Rapids-Standard Co., Inc.

143 For Dumping 'Most Anything—Features and advantages of multi-purpose dumpers, designed to handle bulk, bags, drums, barrels, boxes etc., are detailed in this 8-pp bulletin. Typical applications are illustrated, specifications and dimensions included. Essex Conveyors, Inc.

144 MH Equipment Selector—Sixteen-pp Condensed Catalog 80-204 describes and illustrates manufacturer's line of materials handling equipment. Offers specifications and illustrations on rider fork lift trucks, rider tractors, narrow aisle rider electrics, electric powered walkies and manual equipment. A selector chart shows types. Lewis-Shepard Products Inc.

(More Bulletins on page 211)



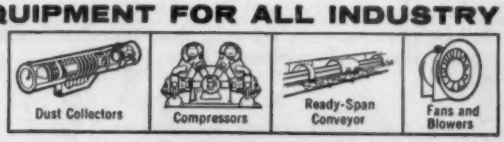
SET A 350 TO 1250 HP AIR COMPRESSOR IN THE CORNER OF YOUR PLANT . . . *almost as easy as this*

IF YOUR PLANT EXPANDING FACILITIES are requiring more compressed air . . . *and* putting a squeeze on plant space, here's the answer . . . the *new* Joy WN-224 compressor. Because of its compact semi-radial design, the WN-224 is delivered as a package—completely assembled—ready to go. Just bolt it down, connect power, water, and air lines . . . and you're ready for long, continuous service. This is the only true "package" compressor available in these capacities . . . 2418 to 7392 cfm . . . horsepower ratings from 350 to 1250.

AND THE WN-224 SOLVES YOUR SPACE PROBLEMS . . . it can be installed where no other compressor of equal capacity will fit. Instead of long, horizontal units on massive foundations, the Joy WN-224 has four cylinders arranged semi-radially around the frame. This compact, balanced arrangement assures smoother running, gives longer service with far less maintenance. Get the whole story on the WN-224. Ask for free Bulletin No. 179-15.

I 6666R-179

AIR MOVING EQUIPMENT FOR ALL INDUSTRY

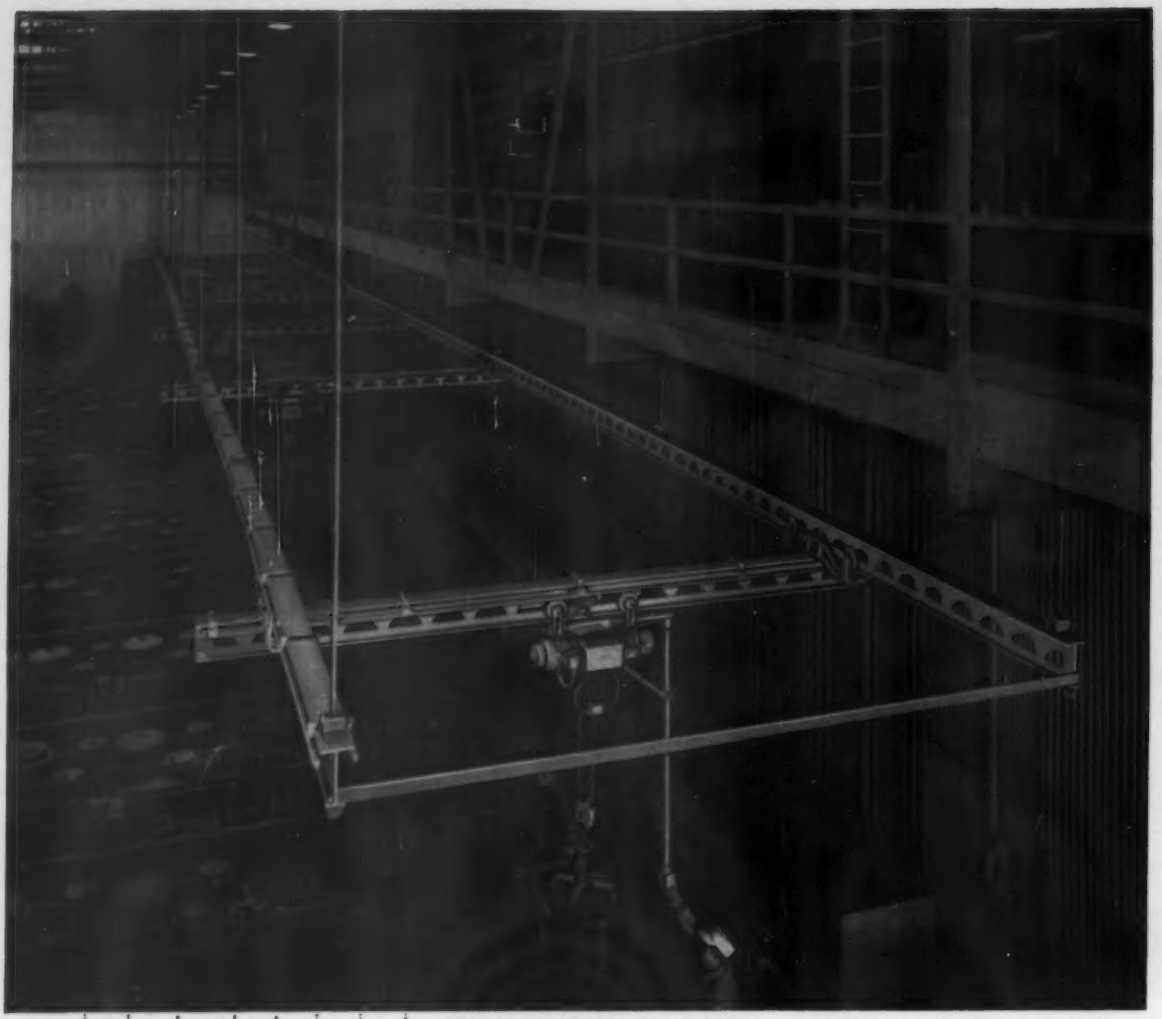


JOY

Joy Manufacturing Company
Oliver Building, Pittsburgh 22, Pa.

In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario

For more facts circle 515 on Reply Card



This installation consisting of seven hand-propelled cranes on a flexibly suspended runway is used for stripping wire blocks in a large steel mill.

Note how easy it is with the Cleveland Tramrail design to position the runway at any level or location desired. Likewise, it is extremely simple to dismantle and relocate the equipment to serve some other application, should such ever be necessary.

FLEXIBLE SUSPENSION

Assures Smooth Crane Operation

CLEVELAND Tramrail's unique flexible suspension method of supporting crane runways prevents binding of wheels on the tracks and assures smooth easy rolling operation, regardless of location of the load on a crane bridge.

The floating runways compensate automatically for normal skewing or twisting of crane bridges.

This is one of the reasons why hand-propelled Cleveland Tramrail cranes can be used for so many jobs where motor-driven cranes would otherwise be required.

Operation is so easy that Cleveland Tramrail guarantees a starting effort of 15 lbs. and running effort of 10 lbs. per ton weight.

Write for free copy of illustrated booklet No. 2008, "Engineering and Application Data".

CLEVELAND TRAMRAIL

Overhead Materials Handling Equipment

CLEVELAND TRAMRAIL DIVISION • THE CLEVELAND CRANE & ENGINEERING CO. • 7512 E. 290 ST. • WICKLIFFE, OHIO

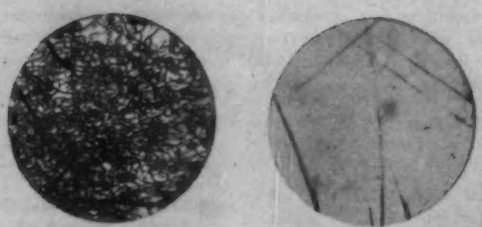
For more facts circle 516 on Reply Card

Look for the label that assures WEATHER-RESISTANCE

When you see this label on a glass-fiber reinforced panel, you can stop worrying about how the panel will look after years of outdoor exposure. The label certifies that the panel is made with PARAPLEX P-444 acrylic-polyester resin, and means that the panel will show practically no discoloration or fiber evidence even after years of exterior use. The photomicrographs below show the difference, after 36 months, between test panels made with PARAPLEX P-444 and those made with conventional light-stabilized polyester resin.

Only panels made with PARAPLEX P-444, the Rohm & Haas acrylic-polyester resin, can bear this identification label. We will be glad to send you the names of manufacturers who use PARAPLEX P-444.

36-MONTH FLORIDA EXPOSURE TEST



Conventional light-stabilized resin — PARAPLEX P-444

Chemicals for Industry

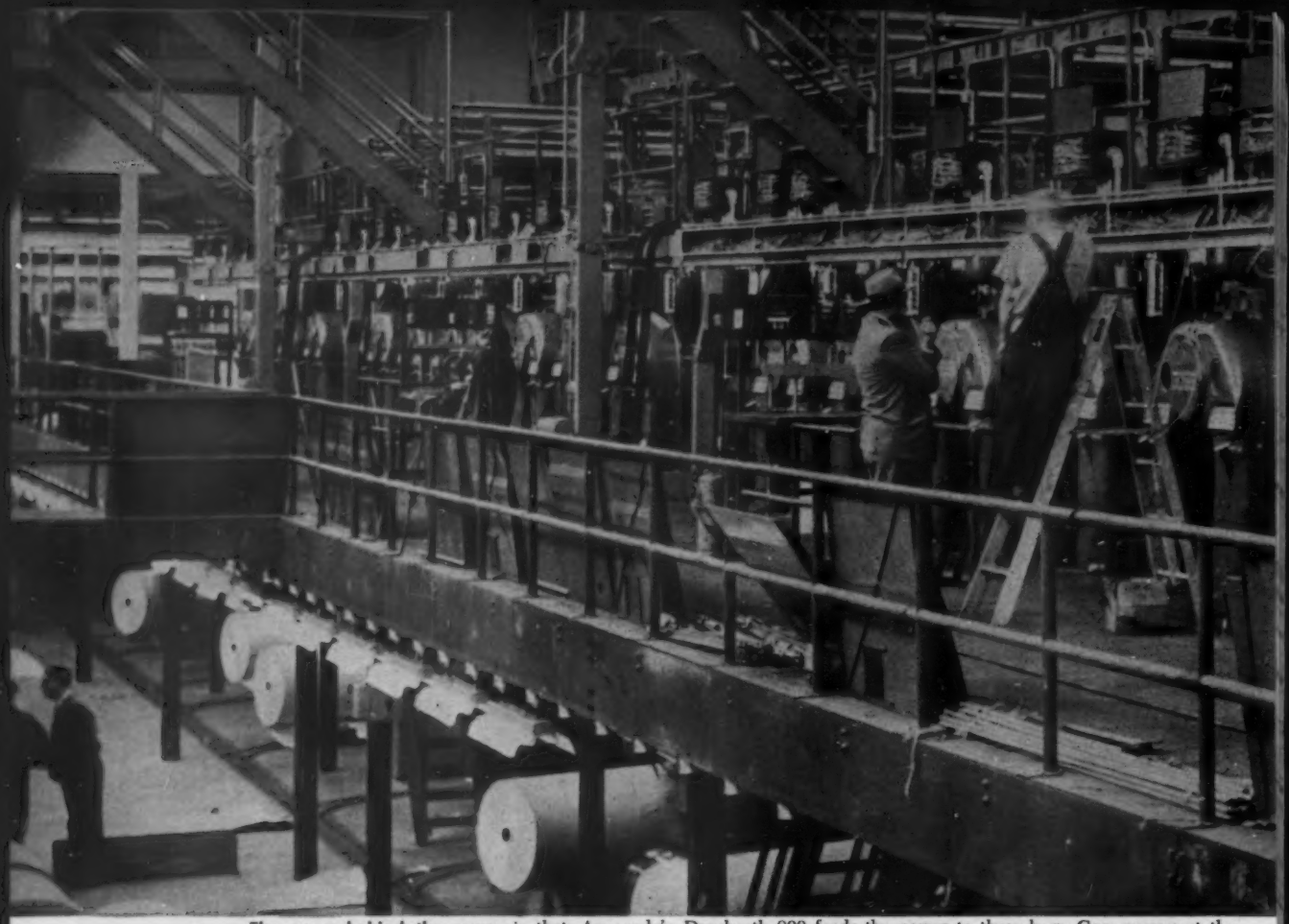
ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

PARAPLEX is a trademark, Reg. U.S. Pat. Off. and in principal foreign countries.

PARAPLEX P-444

For more facts circle 517 on Reply Card



The news behind the news—is that Anaconda's Densheath 900 feeds the power to these huge Goss presses at the Chicago Sun-Times' new Fort Dearborn plant. Densheath 900's special heat-resistant insulation enables current to be car-

AT THE CHICAGO SUN-TIMES

An extra margin of safety and increased are provided by Anaconda's new

Electrician laces in Anaconda Densheath 900 for a 50-hp press-drive motor. In addition to three master panels, each press has its own control panel.

Nothing "spoils" as fast as news. Thus, in a newspaper operation, there's no time for machine breakdowns, costly delays. The news *must* get out!

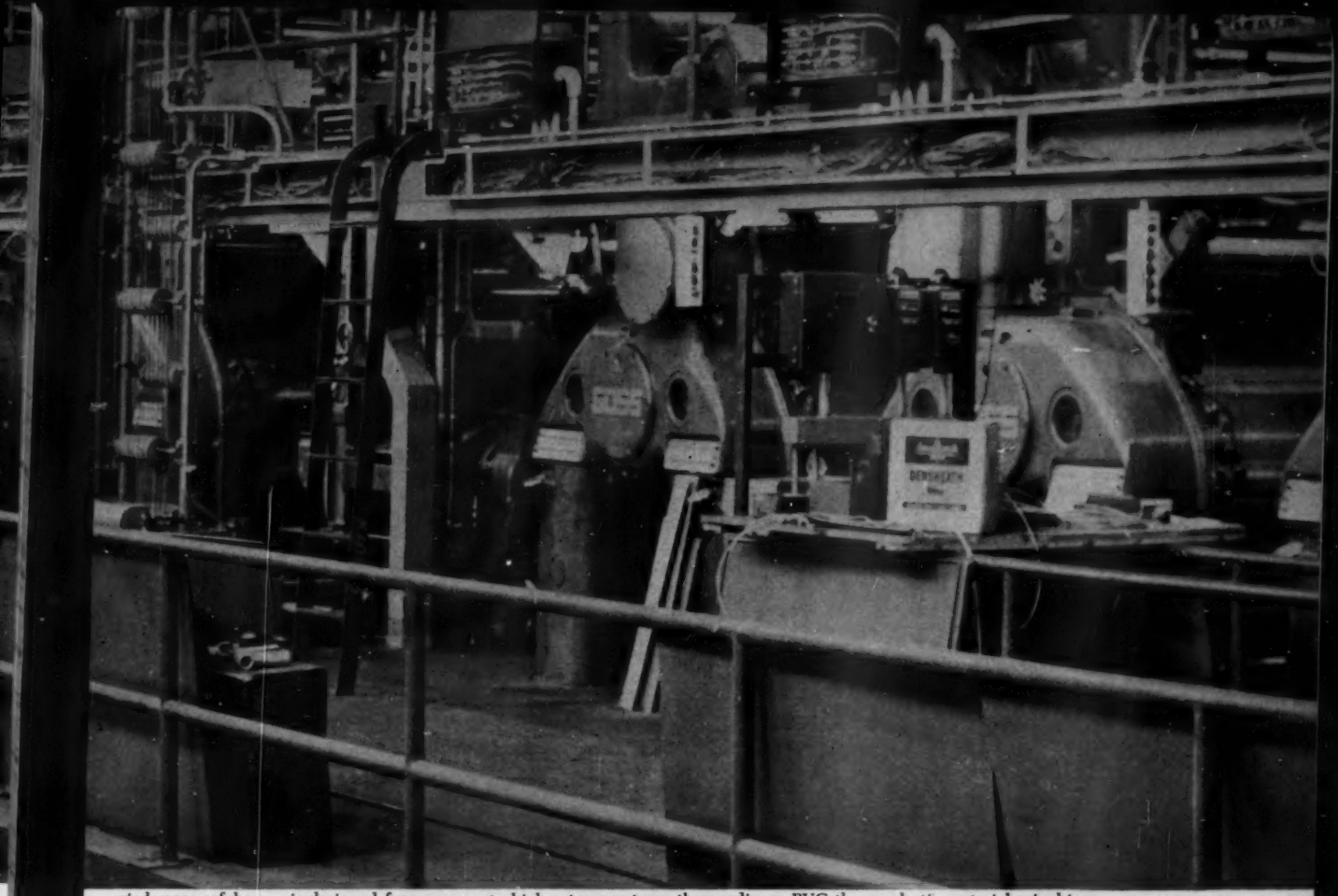
To see that it does—at the Chicago Sun-Times—Anaconda's Densheath 900 is on the job powering 30 giant Goss presses, plus teletypes, intercom systems, office equipment.

In *your* business, too, power failures can mean *serious* losses. Densheath 900 has the *"built-in" extra performance* your important circuits require.

Tough, flexible Densheath 900, then, deserves attention. This top-quality industrial wire is sound insurance against power failure. Here's why:

1. **LONG LIFE.** Consistently superior performance throughout the years under the severest operating conditions.
2. **HIGH HEAT RESISTANCE.** Can safely carry higher currents under exposure to higher ambient temperatures.
3. **CHEMICALLY STABLE.** Retains its electrical and physical characteristics despite exposure to cutting compounds, lubricants, most acids and alkalies.
4. **MOISTURE RESISTANCE.** The presence of moisture does not affect the satisfactory performances of Densheath 900.
5. **EASY TO INSTALL.** Flexible, easily formed, resists tearing, abrasion and stretching, strips easily.
6. **LESS "DRAG."** Coated with exclusive new "slipper" coat which offers less drag, greater resistance to scraping.

If yours is a plant now going to higher ambients, or higher temperature operations in corrosive atmospheres, Densheath 900 will be of particular interest. It provides an extra margin of safety for those "hot spots" which



ried more safely . . . is designed for exposure to higher temperatures than ordinary PVC thermoplastic materials. Architects for the new building were Naess and Murphy, Chicago. Electrical Contractor: White City Electric Co., Chicago.

protection against power failures industrial wire—Densheath 900!

are always occurring . . . assures superior performance from your wiring. For contractors and distributors, Densheath 900 offers another advantage: it eliminates duplicate stocks, since the one wire can be used for building construction, appliance and machine tool applications. See the Man from Anaconda or your Anaconda Distributor about Densheath 900. Anaconda Wire & Cable Co., 25 Broadway, New York 4, N. Y. 58004

RATINGS

The exceptional heat, chemical and moisture resistance of Densheath 900 enables it to satisfy the following:

- *U/L requirements for type TW*
- *ASTM D 734 Polyvinyl Insulating Compound*
- *90C Switchboard, Appliance and Machine Tool Wiring*
- *National Machine Tool Builders Association Specifications*

SEE THE MAN FROM **ANACONDA®**

FOR **DENSHEATH 900**

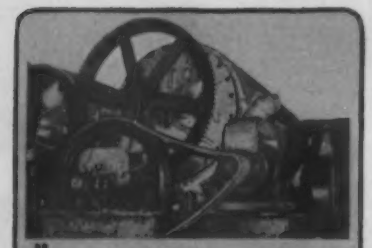
ANACONDA 900 DENSHEATH

DENSHEATH 900

Densheath 900, the 90C industrial wire, is the result of more than 20 years of Anaconda's research and development in the field of thermoplastic wire and cable. Its specially heat-resistant insulation handles current more safely . . . it is designed for exposure to higher temperatures than ordinary PVC thermoplastic materials.

Underwriters' Laboratories Inc. Labeling: Type TW, Oil Resistant 60 C. Sizes 14 Awg through 4/0-Awg also labeled as Appliance Wiring Material for use at temperatures not exceeding 90C, or not exceeding 60C where exposed to oil.

For more facts circle 518 on Reply Card



"THIS LUBRICANT INCREASED CHAIN LIFE 4 TIMES"

—says FASTERFAT, Division of National Sea Products Limited

"Two years ago we switched from the lubricant we were then using to your LUBRIPLATE, and we are pleased to inform you that we have had very excellent satisfaction from its use. High speed silent chains on the drives of our fish meal cookers, which were formerly worn out in about six months, are still in service after two years."

REGARDLESS OF THE SIZE AND TYPE OF YOUR MACHINERY, LUBRIPLATE GREASE AND FLUID TYPE LUBRICANTS WILL IMPROVE ITS OPERATION AND REDUCE MAINTENANCE COSTS.

LUBRIPLATE is available in grease and fluid densities for every purpose . . . LUBRIPLATE H. D. S. MOTOR OIL meets today's exacting requirements for gasoline and diesel engines.

For nearest LUBRIPLATE distributor see Classified Telephone Directory. Send for free "LUBRIPLATE DATA BOOK" . . . a valuable treatise on lubrication. Write LUBRIPLATE DIVISION, Fiske Brothers Refining Co., Newark 5, N. J. or Toledo 5, Ohio.

For more facts circle 519 on Reply Card

BACKTALK AND FORETHOUGHTS

Edited by Marjorie E. Weissman

Establishing PM Schedule

PLANT ENGINEERING:

"Our firm is in the process of establishing a preventive maintenance schedule for the equipment in the plant, and we would very much appreciate tear sheets of the following articles: 'Preventive Maintenance Forms and Procedures in Action,' January, 1958; 'Maintenance System for Top Machines,' March, 1958; and 'Operating Maintenance Shops,' April, 1959.

"If there is any other information available along this line, we would appreciate your including it as well." *R. D. Harris, Industrial Engineer, The Richmond Foundry & Mfg. Co., Richmond, Va.*

▸ The articles requested by this reader have been sent to him, along with several others which we hope he will find useful.—*Editors.*

Still Popular

PLANT ENGINEERING:

"Will you kindly send us 20 copies of the reprint 'Industrial Ventilation' by K. E. Robinson, General Motors Corp., which was printed in your February, 1957 issue of PLANT ENGINEERING magazine.

"We have found this article most helpful in explaining these principles to consulting engineers. We appreciate your courtesy in forwarding the requested material to us." *J. Brooks Semple, Engineered Heat Equipment Co., Lima, Pa.*

▸ Copies of this eight-page reprint are available at a cost of 25 cents each.—*Editors.*

Rocket Power In the Plant

PLANT ENGINEERING:

"The June, 1959 PLANT ENGINEERING contained an article entitled 'New Maintenance Tool—Rocket Power,' on pages 122, 123 and 124. I am extremely interested in the portion dealing with the rocket fueled welding torch. The article states that this device has been perfected by the Aerojet General Corporation.

"I wish to obtain further information relative to this device but I am unable to locate the address of the above-mentioned company. I would appreciate any information that you might have relative to this company and its device." *F. E. Mahnken, Asst. Div. Supt., Gas and Gas Products Dept., Sinclair Oil & Gas Company, Houston, Tex.*

PLANT ENGINEERING:

"Reference is made to the article on 'Plastic-Covered Welder,' page 123 of PLANT ENGINEERING, June 1959.

"In that a source of supply was not listed in the above article, it would be appreciated if you would forward to the undersigned the name of the manufacturer and/or the name of the supply house." *Paul F. Koch, Acting Chief, Maintenance Div., U.S. Army Biological Warfare Laboratories, Fort Detrick, Frederick, Md.*

PLANT ENGINEERING:

"Please send me information on, and the name of the manufacturer of the rocket fire extinguisher as described on page 122 of the June, 1959 issue of PLANT ENGINEERING." *F. B. McConnel, Mechanical Engineer, The Pittsburgh & Lake Erie R.R. Co., McKees Rocks, Pa.*

▸ The rocket welding torch is made by Grand Central Rocket Co., Redlands, Calif., and this request has been passed along to that company.

The Aerojet General Corporation, Azusa, Calif., which happened to be mentioned directly beneath the paragraph describing the welding torch, makes the prime-mover rockets for moving freight cars, the "demolition" rocket and Aeropak—a rocket hoist device for workers—all mentioned in our article.—*Editors.*

The Trouble With Stuffing Boxes

PLANT ENGINEERING:

"Because I have had to contend for many years with packing problems for pressures from vacuum to 35,000 psi in a wide variety of services, I read with interest Mr. C. F. Moore's article, 'Compression Packings—Are You Using the Right One,' in the June, 1959 issue, PLANT ENGINEERING. But I can't agree with much that he said about shaft packing.

"It is true that 'The two lowest rings in the set will probably look almost as fresh as the day they went in because most of the "squeeze" shows up in the compression of only the top rings.'

"The reason for this is because the design of the stuffing box, particularly if it has a lantern ring, is inherently wrong. If a lubricant is used, it can-

New from Wright!

Built-In Overload Protection for Operator, Load and Hoist with the New Wright Overload Cutoff*!

• Now, for the first time on any electric hoist, you can have safe, sure mechanical overload protection as a built-in feature with the **WRIGHT Overload Cutoff.** Designed and built to fit any new WRIGHT *Speedway* Electric Hoist, the Overload Cutoff unit you see pictured above is a compact, integral part of the hoist frame itself. As a result, it becomes a functional part of the hoist *at no sacrifice in headroom.* The WRIGHT Overload Cutoff is simple in design and should give dependable, trouble-free operation during the entire life of the hoist under normal operating conditions. Calibrated and sealed at the factory for the user's protection, the unit takes rugged abuse up to the critical point of overload—then instantaneously "breaks" the raising circuit of the hoist. This allows the load to be safely lowered to the floor and unhooked. Once this is done, the raising circuit of the hoist is again automatically restored.

The WRIGHT Overload Cutoff is available now as standard equipment on all new WRIGHT Frame 2 & 3 *Speedway* Electric Hoists, and as optional equipment on new Frame 1 & 1½ models.

Find out how WRIGHT *Speedway* Hoists equipped with Overload Cutoff can bring practical, fast-acting overload protection to your material handling operations. For complete information, write our York, Pa., office.

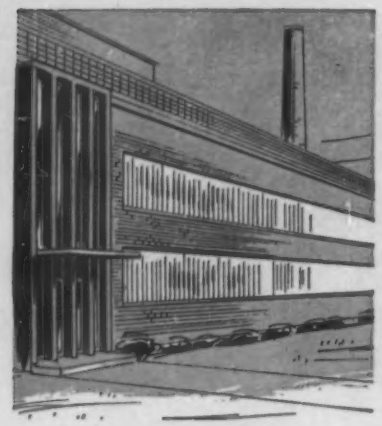
*Patent applied for

WRIGHT HOISTS

Wright Hoist Division • American Chain & Cable Company, Inc.

York, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

For more facts circle 520 on Reply Card



For unbreakable windows and skylights

NEW

Stylux ™ BY BUTLER

LONGER-LASTING SHATTERPROOF PLASTIC PANEL

End window breakage and glare, cut glazing expense with new weatherproof Stylux, the longer-lasting panel. New, improved resins and fiberglass mat plus superior bonding process create a premium-quality panel with up to 90% light transmission. Costs less to install, too, with new 4-ft. coverage widths. Also all standard sizes. Get literature, specs, from your Building Supply Dealer, Glazing Contractor or write direct.

Stylux BY BUTLER

Plastics Department,
Buildings Division
BUTLER
MANUFACTURING
COMPANY
Dept. 113, 7400 East 13th Street
Kansas City 26, Missouri

For more facts circle 521 on Reply Card

BACKTALK— FORETHOUGHTS

not possibly get to the point where it is needed, which is between the outer rings of packing and the shaft. Leakage is not desirable because it can't be controlled and in many services should not be permitted.

"Actually, the type of packing used is only about 10 per cent of the problem. For example, in May 1958, I made packing applications on two shafts in a difficult service that had been requiring packing adjustment two or three times a day and a complete replacement in less than two weeks.

"Just a few days ago, I was informed by the company that my packing arrangement had been in operation for a year without being adjusted or touched.

"Note that I say 'packing arrangement' because the same packing was used in both cases. The answer is that provision was made for the lubricant to get where it was needed. Very little is required if it can get between the rubbing surfaces.

"There is no question that a reappraisal of basics is in order but this should be to determine what is wrong, not with the packing, but with the conventional design of the stuffing box which has not been changed since it was invented." *Walter Coopey, Engineering Consultant, Charleston, W. Va.*

Parking Lots Again

PLANT ENGINEERING:

"We are in the process of revamping our parking facilities and would appreciate receiving any tear sheets you may have available on this subject.

"The articles in PLANT ENGINEERING have proved to be very helpful to us in many ways. Keep up the good work!

"Thank you very much for whatever assistance you can give us. We shall look forward to hearing from you." *Adolph Schubert, Jr., Chief Engineer, B. D. Eisendrath Tanning Co. of Racine, Racine, Wis.*

Electric Shock

PLANT ENGINEERING:

"Would it be possible to get six additional copies of the article 'When Is Electric Shock Fatal?' in the April issue of PLANT ENGINEERING, on pages 136 and 137?

"This appears to be a very timely article for various of our shop people and I would like to have enough copies to circulate through our shops." *Ben W. Schaefer, Superintendent, Iowa State College of Agriculture and Mechanical Arts, Ames, Ia.*

PLANT ENGINEERING:

"The article 'When Is Electric Shock Fatal?' appearing in PLANT ENGINEERING, April, 1959, pages 136 and 137, is one of the best presentations on the subject we have ever seen. We would appreciate receiving 11 copies or tear sheets of this article for distribution to our personnel." *H. L. Cromwell, Stauffer Chemical Co., Freeport, Tex.*

PLANT ENGINEERING:

"Kindly advise if we may have your permission to use the illustration depicting the three causes of electrical contact appearing in your April, 1959 issue of PLANT ENGINEERING.

"With your permission, this cut will be used in our monthly newsletter to our employees.

"Credit will of course be given your magazine." *Myron L. Anderson, Safety Coordinator, Spencer Kellogg and Sons, Inc., Buffalo, N. Y.*

▶ Permission given. This article, which has interested many readers, describes the conditions necessary to receive electric shock and the degree of hazard involved under varying circumstances.—*Editors.*

No Mutilated PI.E. Copies Here

PLANT ENGINEERING:

"You would oblige me very much if you would send tear sheets of seven articles which have appeared in your magazine. Since I intend to keep the articles for my personal file I would not want to mutilate reference copies of PLANT ENGINEERING to get them.

"The list is as follows:

"January 1959—Procedures for Maintenance Work Control, page 101; Bonus Pay for Maintenance, page 113.

"December 1958—Teflon Packings and Seals, page 108.

"September 1958—Study of Urethane Coatings Under Tough Corrosion Conditions, page 92.

"August 1958—Why Specifications Are Important, page 97; Oil Seals Are Important, page 119.

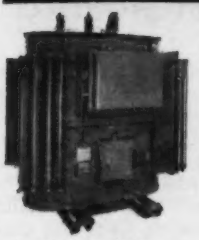
"November 1957—Why 480-Volt Distribution?, page 94." *Charles R. Tod, Supervising Staff Engineer, Plant Engineering, Manufacturing Div., Ford Motor Company of Canada, Ltd., Toronto, Ont., Canada.*

▶ A copy of each of the articles mentioned has been sent to Mr. Tod with the compliments of the editorial department.—*Editors.*

Top Quality substations...

15 kv outdoor primary unit substation styled by Raymond Loewy

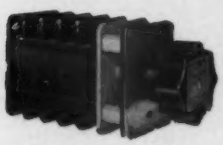
every major component manufactured by Federal Pacific



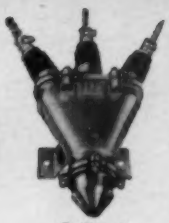
Power Transformers

Protective Relays

Indicating Instruments



Instrument Switches



Potheads

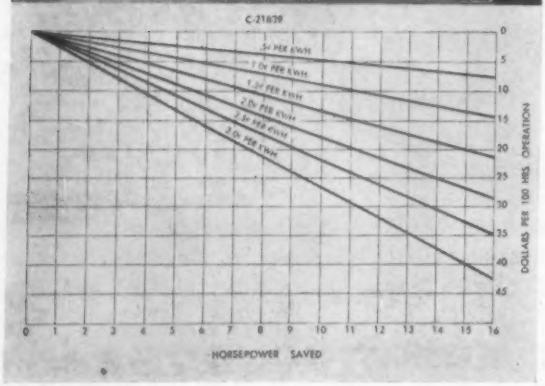
High Voltage Air Breakers

For single-source responsibility and reliable operation, look to Federal Pacific, one of only three companies to manufacture every major component of its primary unit substations. Federal Pacific's unit engineering, coordinated assembly, integrated quality control assure you built-in reliability and longer substation life. Federal Pacific Electric Company, General Offices: Newark 1, New Jersey.

FPE **FEDERAL PACIFIC ELECTRIC COMPANY**

The Best in Electrical Distribution and Control Equipment

For more facts circle 522 on Reply Card



How do you know when you need a new pump?

"One way is to calculate power saving," writes Phil Olmstead, *Chief Engineer*, Goulds Pumps, Inc.

If your *needs* have changed since you installed your present pump, or . . .

If *efficiency points* have changed due to deposits building up in your piping, or . . .

If your present pump is *frequently under repair*, then . . . it's about time you began thinking about getting a new pump!

That's a pretty good rule of thumb to go by when the time comes to consider replacing an old pump with a new, efficient unit. But you don't have to rely merely on rules of thumb—you can actually *calculate* the power saving a new pump will bring you. Let me illustrate:

Only recently I discussed and demonstrated power saving with an engineer friend of mine. He had a pump that he had purchased five years ago. At that time its efficiency was high . . . but changing conditions led to reduced efficiency. According to the pump curve, its efficiency had dropped to 73 per cent: *600 gallons per minute @ 240 total dynamic head (pressure)*.

To prove a point, we went through the Goulds catalog and found a pump with the same rating but which was 82% efficient.

Next we merely applied the following formula to determine the brake horsepower:

$$BHP = \frac{\text{Gallons per Min.} \times \text{Total Head in feet}}{3960^* \times \text{Pump efficiency expressed as a decimal}}$$

*Horsepower conversion figure (foot-pounds to gallons per minute)

This is what we got:

$$\text{OLD PUMP: } \frac{600 \times 240}{3960 \times .73} = 49.8$$

$$\text{NEW PUMP: } \frac{600 \times 240}{3960 \times .82} = 44.3$$

HP SAVED: 5.5

Now check the savings chart illustrated on this page. Follow the "HP saved" line to the electric current rate line—in this case, 2¢ per KWH. The savings per 100 hours of operation would be approximately $10. At, say, 10 hours a day, 300 days per year, my friend saw that he would be saving around $300 with a new pump.

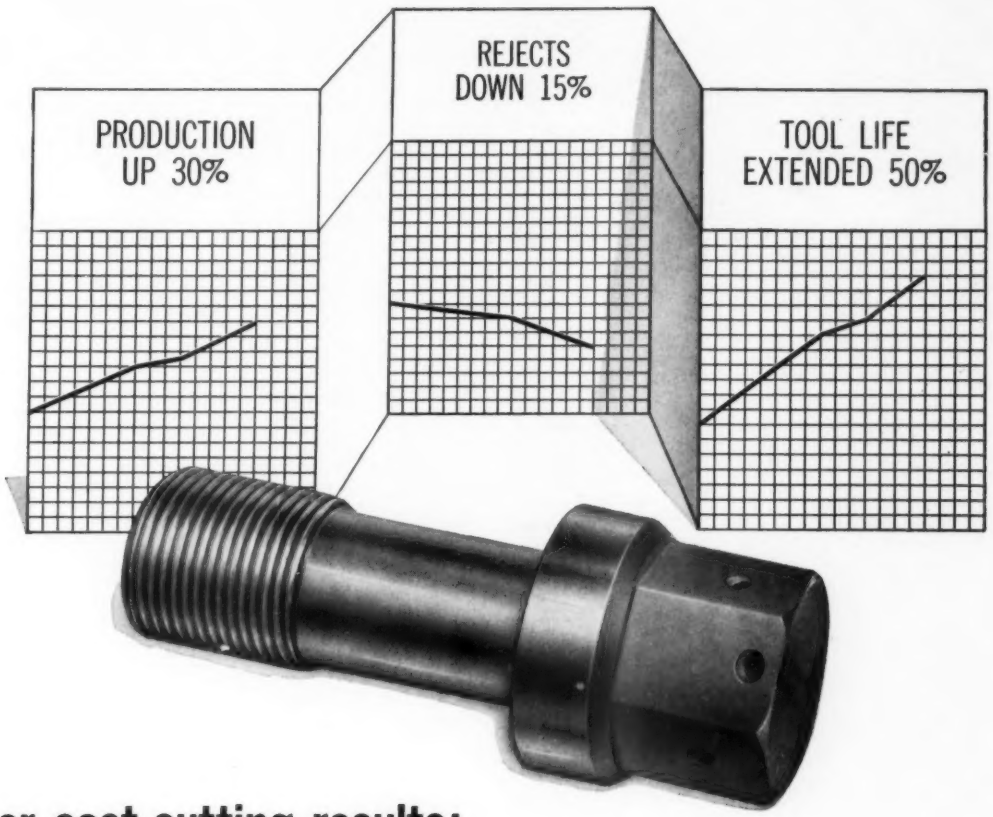
Try it for *your* pump. Calculate how much you would save with a new Goulds pump replacing your old one. Then call in a Goulds application engineer to talk it over and determine the *right* one for your needs. Or drop a line to me, Phil Olmstead, at Goulds Pumps, Inc., c/o Dept. PE-89, Seneca Falls, New York, and I'll see that you get the information you need.

GOULDS PUMPS

For more facts circle 523 on Reply Card

Value analysis boosts production 30%

This was the outstanding result when a metalworking company studied and evaluated production of piston pin bolt heads with a Ryerson representative. The Ryerson specialist recommended Rycut® 40—the world's fastest machining alloy steel in its carbon range.



Other cost-cutting results:

In addition to boosting production, this risk-proof Ryerson alloy reduced rejects 15% . . . increased tool life 50% . . . and gave parts a better finish. Ryerson value analysis of materials and methods may help solve some tough problems for you. Contact your nearby Ryerson plant for details.

RYERSON STEEL®

Member of the INLAND Steel Family

STEEL • ALUMINUM • PLASTICS • METALWORKING MACHINERY

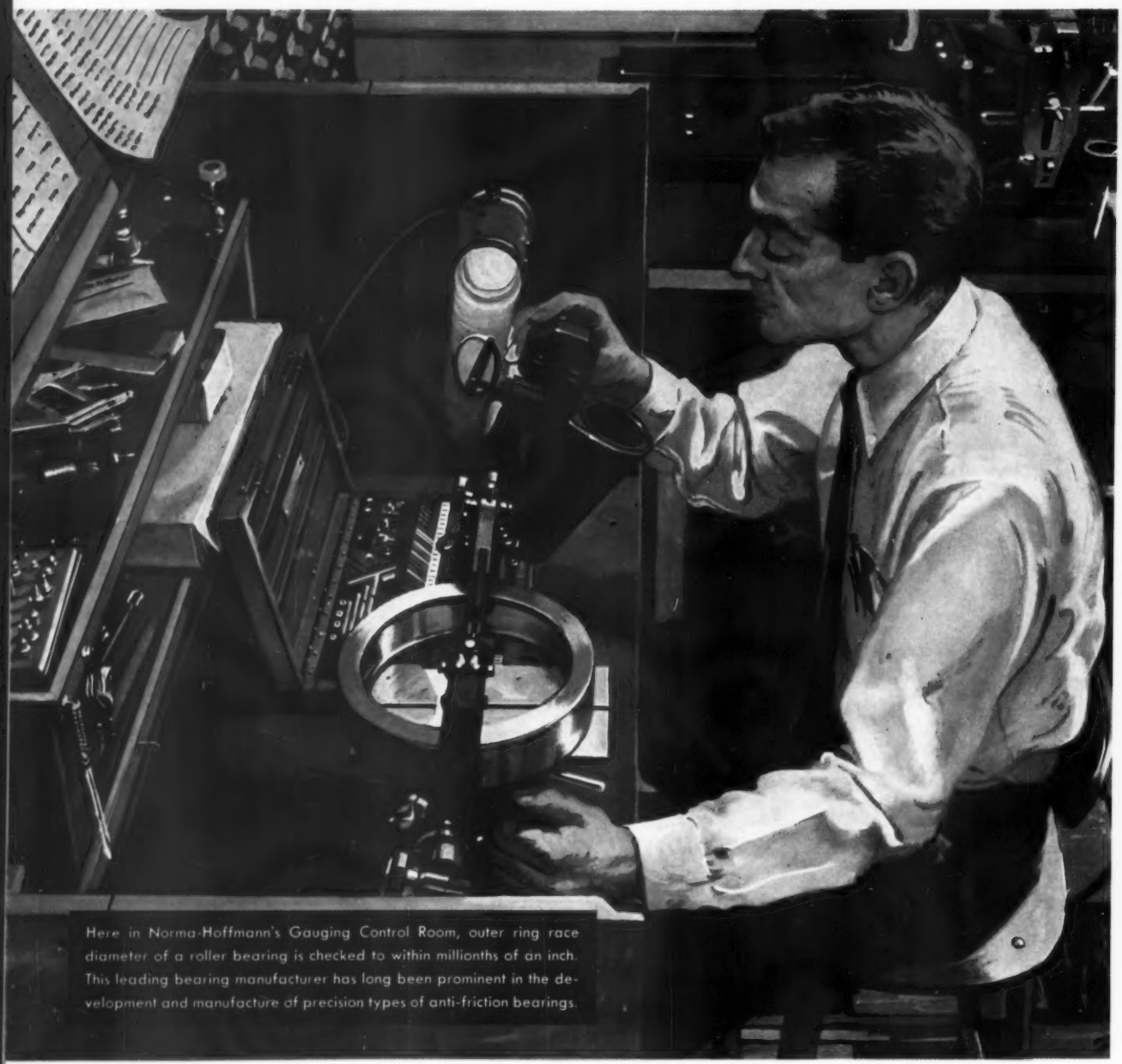
NATION'S MOST COMPLETE SERVICE CENTERS IN PRINCIPAL CITIES COAST TO COAST

For more facts circle 524 on Reply Card

For more facts circle 525 on Reply Card →

Correct Lubrication in Action...

Bearing manufacturer



Here in Norma-Hoffmann's Gauging Control Room, outer ring race diameter of a roller bearing is checked to within millionths of an inch. This leading bearing manufacturer has long been prominent in the development and manufacture of precision types of anti-friction bearings.

Mobil

Complete Engineering Program
Proved Petroleum Products

Mobil

rolls up $23,530 saving!

"In a growth company, we cannot afford to delay tomorrow's decisions while we stamp out today's brush fires. What plagues those of us in management are the myriad, small unknown-to-us problems that soar production costs, affect competitive position. This is where Mobil is helping us reduce manufacturing expense and improve production. Our 1958 records show that we saved over three times as much as we spent with Mobil last year . . . a most profitable relationship!"

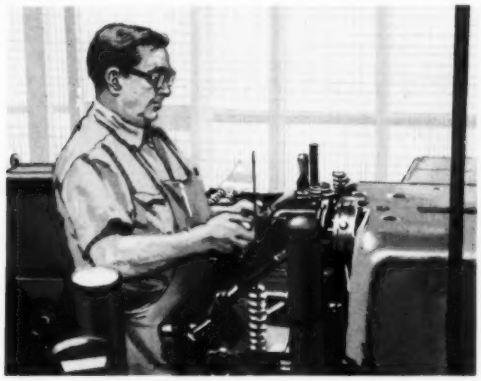
R. D. Robertson

Vice-President—Manufacturing
Norma-Hoffmann Bearings Corporation, Stamford, Conn.

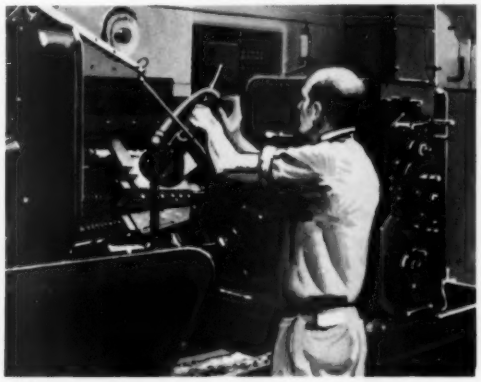
Mr. Robertson's words underscore the importance of Correct Lubrication to any profit-minded manufacturer. At Norma-Hoffmann Bearings Corporation Mobil lubrication engineers work closely with an extremely cost-conscious maintenance department. Downtime, parts replacements and maintenance costs have been cut—$23,530 saved in 1958 alone. Some of these savings are detailed below.

For example: Sticking valves on one grinder were a constant problem. Cause of the trouble was a mystery. Mobil's representative sent a sample of lubricant from the machine's reservoir to the Mobil laboratory. Analysis report led to cause of trouble—a lead sheathed cable submerged in the oil reservoir was contaminating oil. This detective work on the part of Mobil restored continuous production, saved $5,850 in maintenance costs.

This kind of practical engineering help is just a part of a Mobil program of Correct Lubrication. For complete details on how Mobil can improve your profits call your nearest Mobil representative. You'll find—You're Miles Ahead with Mobil!



Erratic, stick-slip operation of three grinders caused poor size holding. Mobil engineers found trouble was caused by deposits on valves and use of incorrect competitive oil. A correct way and hydraulic oil was installed. Greater production, fewer wheel dressings, less scrap and reduction in valve-cleaning costs saved $8,640.

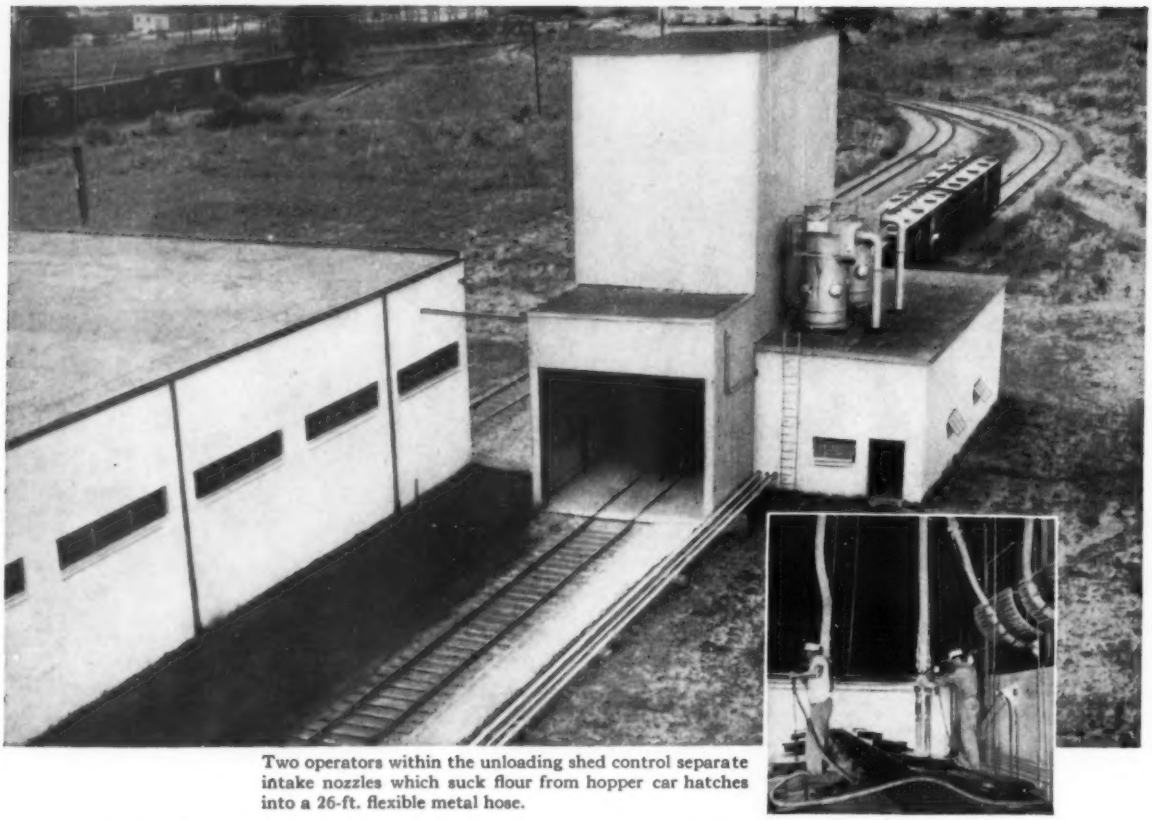


To keep 16 of Norma's Multiple Spindle Bar machines functioning properly required a weekly 40-minute production interruption on each one to supply lubricant for tool slides. Mobil engineer studied procedure . . . suggested a simple lubrication system modification. Application time was reduced 75% . . . $7,040 saved on production and application.

Correct Lubrication

Another reason You're Miles Ahead with Mobil!

The Arithmetic of Materials Handling



Two operators within the unloading shed control separate intake nozzles which suck flour from hopper car hatches into a 26-ft. flexible metal hose.

Flexibility of FULLER Pneumatic Conveying Systems Makes Problem Plant Site Practical For General Mills

The proposed site of a new General Mills flour blending and packaging plant in Louisville, Ky. seemed impractical to mill engineers because of the site's long, narrow shape. Flour, delivered at a dead-end rail siding, would have to be conveyed over unusually long distances—400 feet from unloading point to storage bins.

By incorporating Fuller Airveyor® pneumatic conveying systems in the plant design, General Mills has overcome these disadvantages and has completed one of the country's most modern bulk flour handling plants.

At the new, highly-automated plant, Fuller Airveyors unload Airslide® or hopper cars of bulk flour at 40 tons an hour, flowing it 400 feet to a series of 18 silos. In a completely integrated system, other Fuller Airveyors deliver ingredients for blending, weighing, proportioning and bagging operations. The compact, 5-inch pneumatic pipelines twist and turn easily through what would be cramped or impossible quarters for other methods of conveying. Self-cleaning Airveyors, containing few moving parts, practically eliminate maintenance and industrial hazards.

Production speed, flexibility, sanitation, processing accuracy, push-button control of an entire plant—are just some of the advantages of Fuller pneumatic bulk handling systems realized at General Mills' new Louisville plant. Similar advantages can apply to old plants modernized with the help of Fuller engineering specialists. Write or phone today outlining your problem. Fuller will gladly furnish additional information with appropriate recommendations. 1187 A-269

FULLER COMPANY GENERAL AMERICAN TRADE MARK

FULLER COMPANY
138 Bridge St., Catasauqua, Pa.
SUBSIDIARY OF GENERAL AMERICAN TRANSPORTATION CORPORATION
Birmingham • Chicago • Kansas City • Los Angeles • New York • San Francisco • Seattle

Fuller
....pioneers in harnessing AIR

For more facts circle 526 on Reply Card

STRONGER and SAFER for every high pressure pipeline duty...

...because they are **drop forged by Vogt**

Send for Catalog F-10

Constantly imitated but never duplicated, Vogt forged steel fittings and flanges have unmatched strength and toughness for your most severe pipeline duties. Laboratory controlled materials and Vogt's special forging techniques assure products which are always uniform in structure, fine grained, and free from porosity. Thereby the shocks and stresses imposed by high pressures and high temperatures are easily withstood, and with stubborn resistance to erosion and corrosion. Consult Catalog F-10 for our complete line of fittings and flanges.

For a copy of Vogt Catalog F-10 address Dept. 24A-BPLE.

HENRY VOGT MACHINE CO., P.O. BOX 1918, LOUISVILLE 1, KENTUCKY

SALES OFFICES: New York, Chicago, Cleveland, Dallas, Camden, N. J., St. Louis, Charleston, W. Va., Cincinnati

OTHER VOGT PRODUCTS

Forged Steel Valves — Petroleum Refinery and Chemical Plant Equipment — Steam Generators — Heat Exchangers — Ice Making and Refrigerating Equipment.

Vogt

DROP FORGED STEEL

Fittings and Flanges

For more facts circle 527 on Reply Card

F. N. Burt Company, paper container manufacturer, says:

"WE SAVED MONEY, MATERIALS AND TIME WITH WESTINGHOUSE DT-3 TRANSFORMERS"

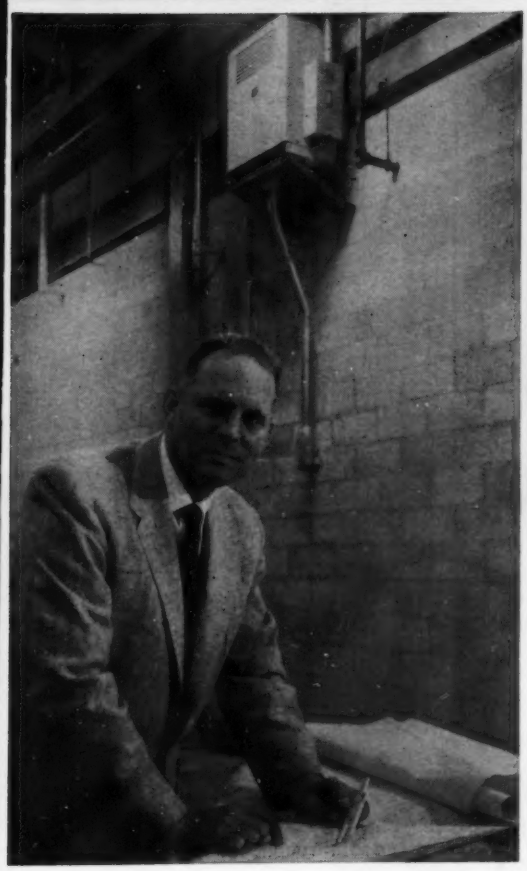
Mr. J. Bober, E. S. Burrows Co., Buffalo; C. Dean, vice president, Buffalo Electric Co., Buffalo; W. Jones, plant maintenance engineer, F. N. Burt Co., Inc., Cheektowaga, N. Y.; C. T. Hansen, Westinghouse sales engineer.

Eight Westinghouse DT-3 Transformers serve 10 acres of office and manufacturing area quietly... quietly... quietly

Inorganic siliclad insulation and grain-oriented Hipersil® steel cores have reduced Westinghouse transformer size 25 to 50%, weight 17 to 32% over former class B 80°C rise units. These Westinghouse exclusives are making possible significant savings in time and money on job after job. Not only that, but every Westinghouse unit is sound-level tested in an ambient of 24 decibels.

Westinghouse dry-type transformers operate at 45 decibels or below . . . 10 to 15 db's below NEMA standards. The core-coil assembly floats on a mechanical vibration damping system, independent of case, base or conduit. This unique feature accounts for the lowest sound levels ever found in dry-type transformers.

Mr. Walter Jones, plant maintenance engineer for F. N. Burt Company, says: "The Westinghouse DT-3 transformers are the quietest units I've ever worked with. We employ about 900 persons—700 of them women. They're



"These transformers serve our entire plant—office, kitchen, manufacturing area, powerhouse. With 10 acres of floor space under roof, we have plenty of maintenance to handle—we really appreciate the maintenance-free design of Westinghouse DT-3 transformers," states Mr. Jones. "All we have to do with these new units is wipe them down with a damp cloth once every six months."

"In some cases," comments Mr. Dean of Buffalo Electric Co., "transformers were installed in areas congested with large air conditioning ductwork and steam piping, at times as close as 24 in. from plant ceiling. The DT-3 transformers are compact enough to fit into these tight quarters, light enough to lift into place without special hoist equipment. Easy to wire, too—terminals are located on the bottom in cool air—giving longer life and less maintenance to cables."

particularly sensitive to noise—a constant humming irritates them. Production drops as nervous tensions increase; hence, we chose Westinghouse quiet transformers."

In addition, overhead mounting without special floor supports saved valuable floor space in the mounting of this series of eight transformers in ratings from 15 kva to 150 kva. Installation time of the Westinghouse units was just one-half the time required to install wet-type units. The largest—at 150 kva—was in place in just a few hours.

Call your Westinghouse representative or distributor for further facts. Or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa.

WESTINGHOUSE DT-3 TRANSFORMERS.....JUST A WHISPER AWAY FROM SILENCE

J-70919

YOU CAN BE SURE...IF IT'S Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV MONDAYS

For more facts circle 528 on Reply Card

PLANT ENGINEERS' DIGEST —so those who rush may read and know what's new

Edited by Marjorie E. Weissman

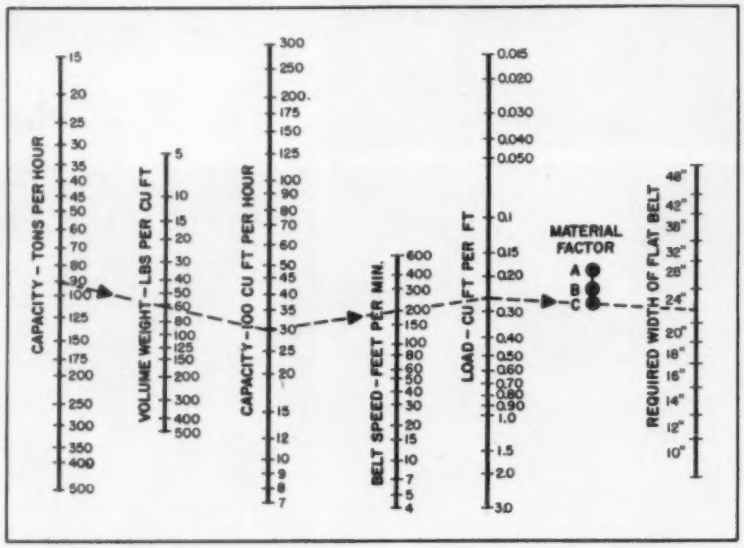
Nomograph Simplifies Conveyor Belt Specification for Handling Various Types of Bulk Materials

TO USE THIS nomograph to determine the proper conveyor-belt width for handling bulk materials, it is necessary only to know the tonnage of material to be moved per hour, its density in lb per cu ft, conveyor speed (fpm), and a "material factor"—A, B, or C, which depends on the characteristics of the material being handled. This factor may be determined from the following table:

Materials with sharp edges	Factor
With or without dry fines	B
With moist fines	C
Materials with round edges	
With or without dry fines	A
With moist fines	C
Powdered materials	
Dry	A
Moist	C
Plastic materials	C

Materials with sharp edges include ores, quartz, limestone, sinter, coal, coke, etc. Materials with round edges include items such as cement clinker, granulated products, gravel, seeds, potatoes, beans, grain, etc. Powdered materials generally are obtained by grinding and include ore concentrates, foundry sand, cement, etc. Plastic materials include dough, fats, clays, margarine, paper pulp, mash, etc.

Although the nomograph was developed for use in specifying steel belt conveyors, it may also be used for other types of flat-belt conveyors.


CAPACITY - TONS PER HOUR
VOLUME WEIGHT - LBS PER CU FT
CAPACITY - 100 CU FT PER HOUR
BELT SPEED - FEET PER MIN.
LOAD - CU FT PER FT
MATERIAL FACTOR
A
B
C
REQUIRED WIDTH OF FLAT BELT

Nomograph is used to determine width of belt for handling bulk materials.

As indicated by the example illustrated on the nomograph, to find the belt width recommended to carry 90 tons per hr of a material weighing 60 lb per cu ft at a speed of 200 fpm and having a material factor of C, one would locate 90 on the "tons per hour" scale and project a line through 60 on the adjacent "lb per cu ft" scale until it intercepts the "cu ft per hr"' scale.

A line is then drawn from this point through 200 on the "feet per min" scale and extended to the "cu ft per ft" scale. From here the line is extended through the "material factor" designation C, and the interception of this line with the final "width" scale indicates that a 24-in. belt should be specified. *From a release of Sandvik Steel Belt Conveyors, Div. of Sandvik Steel, Inc., Fair Lawn, N. J.*

Miniature Railroad Does Tough Jobs for Copper Mine

Miniature railroad consists of two trail cars and half-pint rail tractor driven by storage battery. It is used at copper refining operation to haul eight-ton loads of grinding balls from storage to ball mill. Train runs on 24-in. gage track, travels at 300 fpm. (From a release of Easton Car & Construction Co., Easton, Pa.)

Coated Nylon Fabric Keeps Out Weather

TAILOR-MADE DOCK enclosures of neoprene coated nylon have proved well worth their initial cost of less than $200 each at John H. Breck Inc., Springfield, Mass.

Ordinary enclosures had required

(Continued on page 42)

CROUSE/HINDS

Condulet®
electrical equipment

the one complete line for corrosive locations

Photo shows Feraloy Condulet conduit fitting after several years exposure to hydrochloric acid. Note extreme deterioration of conduit.

RESISTS chemical and galvanic corrosion

RESISTS acids, alkalis, salts

RESISTS varying concentrations and temperatures of corrosive liquids, vapors, gases, dusts

Corrosion problems would be simple if there were a single material which would resist all corrosive substances.

Since there is not, Crouse-Hinds provides electrical equipment in four materials which offer a selection to meet virtually every known corrosion problem . . .

FERALOY® features the desirable characteristics of cast iron: strength, corrosion resistance, versatility, adaptability, economy. Plated with zinc and cadmium, Feraloy Condulets will combat most corrosive elements.

ALUMINUM ALLOY develops its own self-repairing oxide film which resists a number of corrosive conditions. Copper-free Aluminum Alloy Condulets effectively resist galvanic corrosion.

PLAST-A-COAT, a polyvinyl chloride, is a resilient coating which withstands abrasion and repels corrosion from caustics, alkalis and heavy mineral acids. Tough, non-peeling, it also acts as an insulator.

SILICON BRONZE, when all other materials fail, can be furnished for the most extreme corrosion problems. Counteracts virtually all alkalis as well as salt water, sulfur gases, etc.

CROUSE HINDS
SYRACUSE NEW YORK

Write for **BULLETIN #2699** containing full information on Crouse/Hinds Condulets for Corrosive Locations.

Offices: Atlanta, Baton Rouge, Birmingham, Boston, Buffalo, Charlotte, Chicago, Cincinnati, Cleveland, Corpus Christi, Dallas, Denver, Detroit, Houston, Indianapolis, Kansas City, Los Angeles, Milwaukee, New Orleans, New York, Omaha, Philadelphia, Pittsburgh, Portland, Oregon, St. Louis, St. Paul, Salt Lake City, San Francisco, Seattle, Tulsa, Washington. **Resident Representatives:** Albany, Baltimore, Reading, Pa., Richmond, Va.
Crouse-Hinds Company of Canada, Ltd., Toronto, Ont.
Crouse-Hinds Instrument Company, Inc., Silver Spring, Md.

For more facts circle 529 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 40)

Tailor-made dock enclosure of coated nylon eliminates spoiled merchandise.

many repairs, due to rotting and rips, especially under heavy loads of snow. The new enclosures—five were installed in a new warehouse extension—show no signs of wear after more than a year of service.

The enclosures have also provided a reduction in the cost of heating, since very little heat escapes; employees are more comfortable and can work more efficiently; in cold weather, the enclosures prevent freezing of the metal plates bridging the warehouse floor and the railroad cars; and spoilage of merchandise due to leaking enclosures, is practically eliminated. *From a release of Reeves Brothers, Inc., New York, N. Y.*

Water-Cooled Dies Speed Forming

TO SAVE TIME in post-forming laminated plastics parts, the forming dies can be water-cooled. This eliminates the need for separate time-consuming cooling of parts on special fixtures after the forming operation.

The temperature of the part shown in the photograph was lowered to the point where it would take a permanent set in one minute by using the water-cooled die. Air cooling it in a fixture would require approximately five minutes and a special fixture would be needed to prevent the part uncurling during the cooling period.

Plastic is formed in water-cooled die.

Practicability of using water-cooled dies depends upon whether the production run is long enough —10,000 parts and up—to justify the about-double cost of the die; complex curves would otherwise re-

(Continued on page 44)

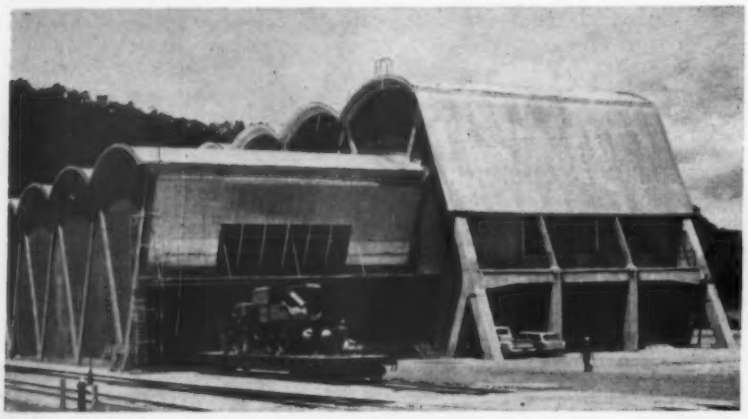
Unorthodox Reinforced Concrete Design Used for Paper Mill to Resist Earthquakes

BECAUSE MEXICO'S first newsprint mill is located in Tuxtepec, a subtropical, earthquake-prone area, where building materials are expensive and steel is scarce, unorthodox reinforced concrete structures were used. Design engineers were Sandwell and Co., Vancouver, B.C.

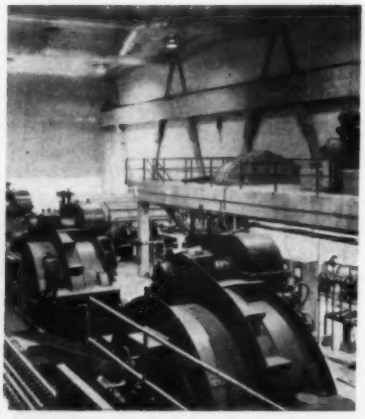
The external walls of the building consist of exposed reinforced concrete, cast-in-place scissors, arranged in a series of triangles along the sides and center of the building. The concrete block and infilling and tie beams are covered both inside and out with glazed ceramic tile.

The scissor design of the columns was evolved to give an economical roof plan, foundation spacing and crane beam span. With the roof and floors, it also provided high earthquake resistance since it has lateral wall bracing, many expansion joints and equalized foundation loading.

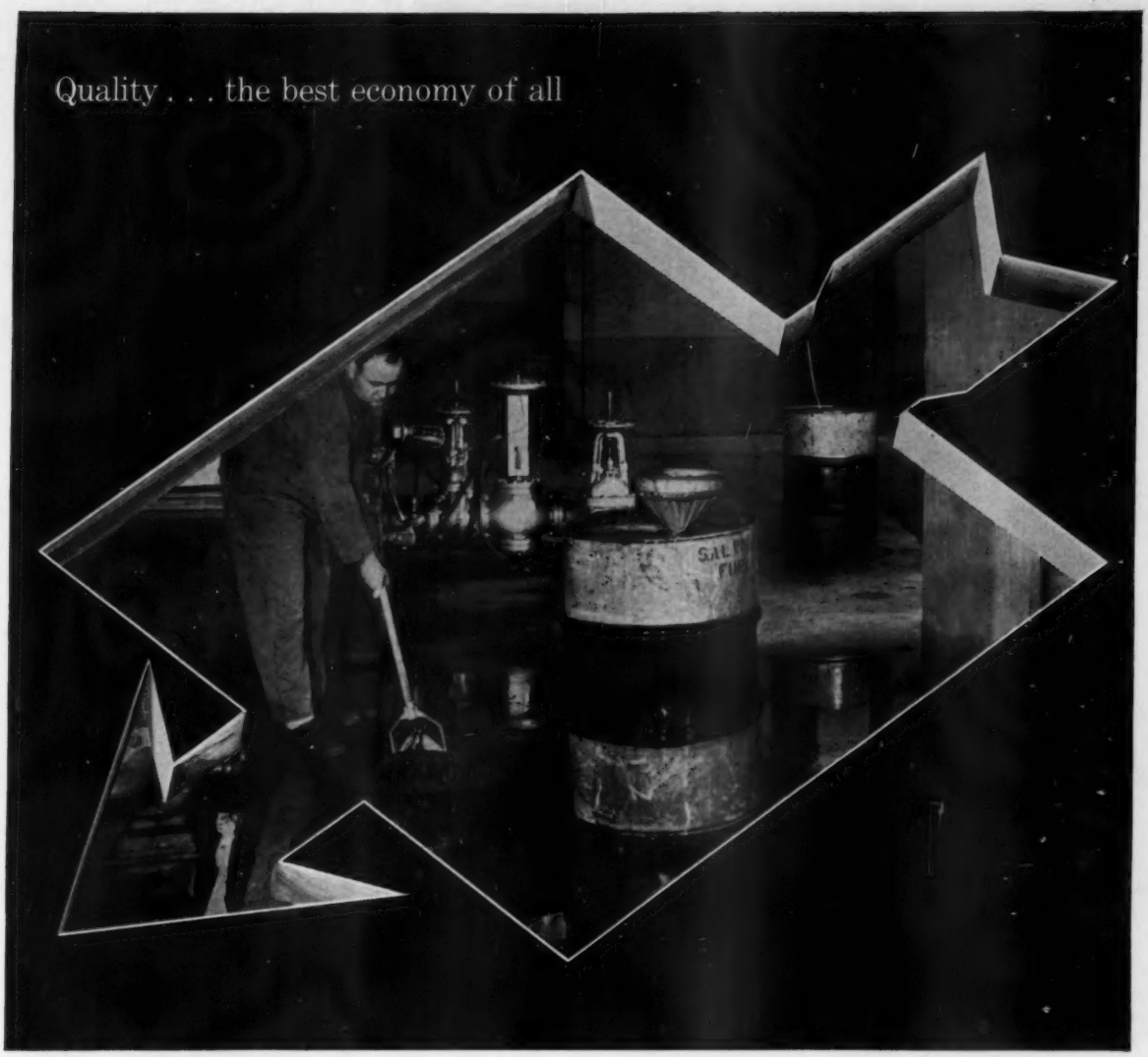
The 3-in. thick shell-concrete roof vaults were cast in place, two at a time, by running plywood formwork along the crane beams inside the building. *From Interbuild, published in London, England.*



Exterior view of mill shows scissor design of columns and concrete roof vaults.



Glazed ceramic tile was used for walls.



He's mopping up the mess for the last time

At a leading aircraft research center, high-frequency vibration caused severe oil leakage from hydraulic lines servicing a huge wind tunnel. Many man-hours each month were wasted cleaning up the basement floor underneath, even though drip pans were used extensively.

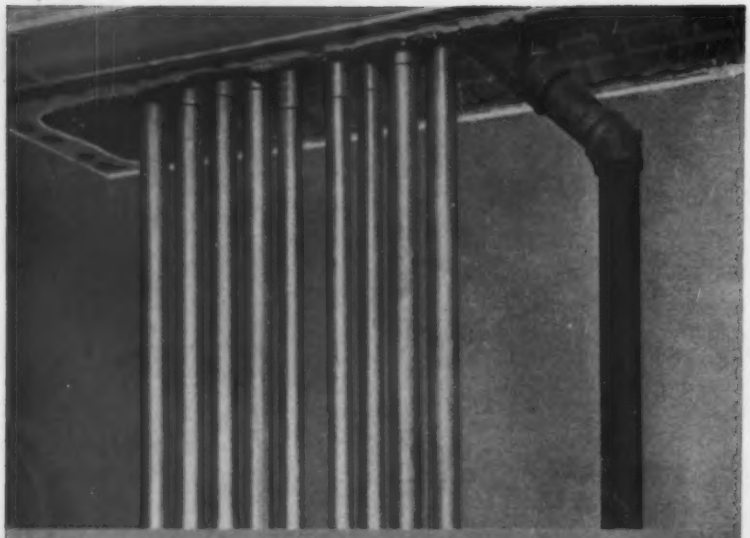
Now, after a change to a Suntac oil, the vibration-caused leakage has been reduced to a point where "mop-up" is not needed. Hydraulic-fluid consumption has been cut by 4000 gallons a year. That's economy! That's Sun quality—the best economy of all.

If your plant is troubled with a leaky system, a Suntac antileak hydraulic oil can save you money, too. Ask your Sun representative to show you the Suntac desk-top demonstration, or write direct to SUN OIL COMPANY, *Philadelphia 3, Pa., Dept. PY-8. In Canada: Sun Oil Company Limited, Toronto and Montreal.*

SUNOCO

MAKERS OF FAMOUS CUSTOM-BLENDED BLUE SUNOCO GASOLINES

For more facts circle 530 on Reply Card



REYNOLDS ALUMINUM
Electrical Rigid Conduit
lightweight! non-corrosive!
competitive in cost!

Reynolds Aluminum Electrical Rigid Conduit cuts both installation and maintenance costs. Weighing approximately two-thirds less than steel conduit, aluminum conduit is easier to handle, faster to install. No special tools or equipment are required. Bending is easier because aluminum "sets"—less spring back.

Aluminum conduit can't rust—ever. This means no replacement worries due to rust—no periodic protective maintenance problems—no rust on walls or surrounding fixtures—no rusting of threads. Aluminum conduit is also corrosion-resistant to water, weather and most industrial atmospheres. Aluminum conduit is non-magnetic. Voltage drop is reduced—longer conduit runs or smaller conductors are possible. Aluminum conduit won't spark from accidental contact blows from hard objects—excellent for use in inflammable areas and atmospheres.

The Finest Products Made with Aluminum
are made with
REYNOLDS ALUMINUM

For more information
and names of Reynolds Aluminum Electrical Rigid Conduit outlets, call your nearby Reynolds Sales Office or write *Reynolds Metals Company, Box 2346-EQ, Richmond 18, Virginia.*

Also write for descriptive brochure.

Watch Reynolds TV show—"WALT DISNEY PRESENTS"—every week on ABC-TV.

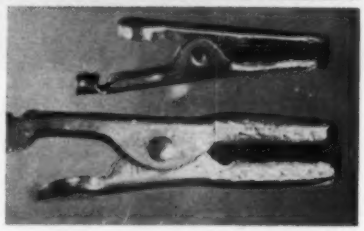
For more facts circle 531 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 40)

quire the molding of special fixtures to prevent the part's uncurling during cooling; or use of cooling fixtures would occupy valuable space or slow the over-all postforming production cycle. Slow-cooling requires three to four times the combined heating and forming time. *From a release of Taylor Fibre Co., Norristown, Pa.*

"Heat Sink" Protects Tiny Components



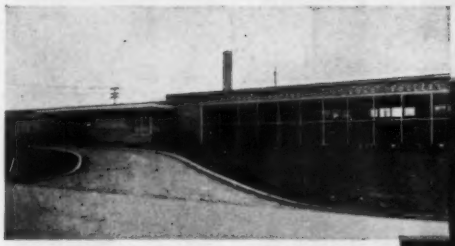
Wetted felt-lined clamps protect delicate electronic components during soldering. Water evaporation dissipates heat which travels along lead wire from soldered joint. (From a release of Boeing Airplane Co., Seattle, Wash.)

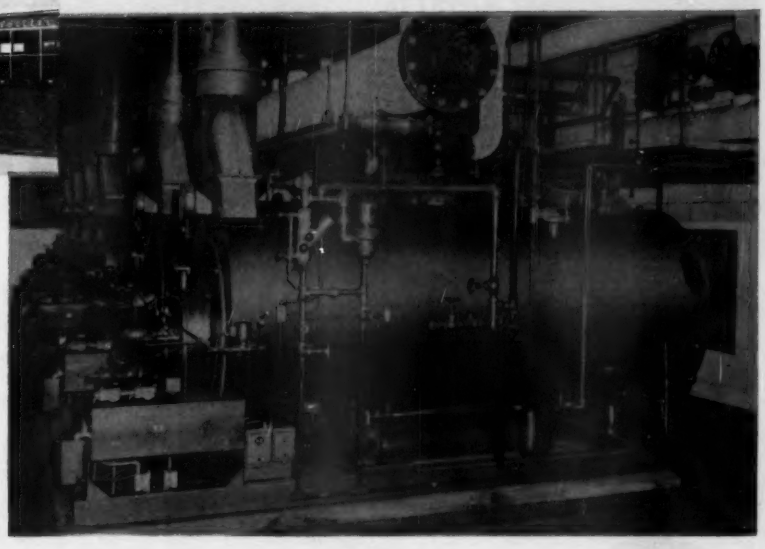
Grinding Large Rolls in Place

LABORIOUS and time-consuming hand methods used to retrue large rolls have been replaced by use of a portable grinder at Manifold Supplies Co., Brooklyn, N. Y.

In the past, hand stones or other hand-held abrasives were used to touch up nicks or gouges. Close tol-

Never more steam than you can use . . .
never less steam than you should have!





One of the largest producers of graders, roadscrapers and rolling equipment, Galion Iron Works & Manufacturing Co., has six 125 HP Cyclotherms now operating, plans to add a seventh and eighth as steam demands increase. Automatic operation has been the big factor in helping Cyclotherm make the grade with the graders!

Like GALION ESTABLISHED 1907 Iron Works, plan for tomorrow with

CYCLOTHERM!

With Cyclotherm Steam and Hot Water Generators, you buy steam capacity as you use it. No investment in excess capacity. No steam shortage with an outgrown boiler.

Cyclotherms give flexible capacity. You can add 518 lbs. of steam per hr. with a 15 HP Cyclotherm, or 25,875 lbs. per hr. with a 750 HP Cyclotherm. And there are 16 intermediate sizes to choose from.

AUTOMATIC OPERATION

Cyclotherms operate with automatic efficiency. On 15 to 60 HP units, burner automatically shuts down when steam demands are satisfied, automatically turns on when more steam is needed. On 80 to 750 HP units, modulation controls regulate firing rate from 30% to 100% of rated capacity, without loss of efficiency. Operation stops automatically if firing sequence is interrupted and unit "fails safe."

BUILT TOGETHER TO WORK TOGETHER

Cyclotherm burner and boiler are built together to work together — one manufacturing responsibility back of the entire equipment. Units are fire-tested at factory, shipped ready to operate. Cyclotherms are up to 1/3 smaller than other package boilers of same capacity. Installation is easy—no costly stack, no excavation, no foundation.

"CYCLONIC COMBUSTION"

"Cyclonic Combustion"—Cyclotherm's patented combustion principle—guarantees a minimum of 80% efficiency, meets all state requirements, conforms to A.S.M.E. and National Board standards, carries Underwriters' Laboratories label. Steam Generators from 15 HP to 750 HP, burn oil and/or gas. Hot Water generators in 10 capacities, from 670, 000 BTU per hr. to 6,700,000 BTU per hr.

YEARS AHEAD IN STEAM & HOT WATER GENERATION
CYCLOTHERM®
STEAM AND HOT WATER GENERATORS

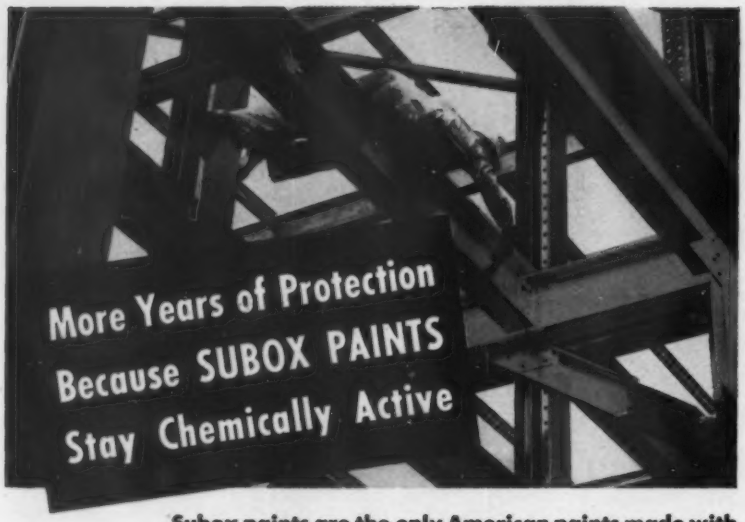
A Division of National-U. S. Radiator Corp. • 54 E. First St., Oswego, N. Y.

Clip to Your Letterhead

54

Please send me your booklet Cyclotherm Cyclonic Combustion, also rotogravure copy of Cyclotherm Sales Steam with illustrations and descriptions of Cyclotherm installations.

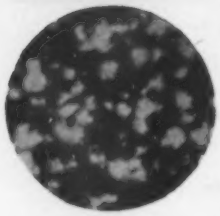
For more facts circle 532 on Reply Card



Subox paints are the only American paints made with lead-suboxide. They give extra protection at no extra cost.

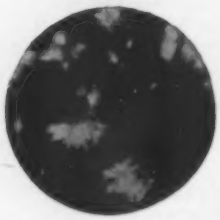
SMALL PARTICLES PENETRATE SURFACE

Maximum penetration is achieved because lead-suboxide is a colloidal pigment. Its film is so dense and impervious that two coats of Subox usually equal three coats of other paints . . . often one coat of Subox is sufficient.



CHEMICALLY-ACTIVE METALLIC FILM

Lead-suboxide remains chemically active after Subox paint dries. It reacts with the fatty acids of the vehicle to form insoluble lead soaps, and builds up a reinforced protective film of intertwining metal-bearing fibers.



FIBROUS COAT IS STRONG ADHESIVE

The fibrous film of Subox gradually strengthens and replaces the original vehicle film (which otherwise would become brittle), and creates a strongly adhesive protective coating with an inherently longer life than that of other paints.

Dark areas in above photomicrographs show how pigment increasingly intertwines to form dense, protective film.

In addition to its other advantages and economies, Subox also saves on eventual repainting. The need for expensive scraping and repriming is largely eliminated.

Available in wide color range. Write for color card and the brochure "Subox Paints".

SUBOX PAINTS

Subox Inc.

Established 1924

Hackensack, N. J.

SUBOX COMPANY OF CANADA—WESTON, TORONTO 15

For more facts circle 533 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 40)

Portable grinder trues rolls in place.

erance grinding, however, was impossible unless the mill was dismantled and the rolls returned to the manufacturer. Now, the portable grinder redresses to within 0.00045-in. on roundness and straightness without the necessity of removing the rolls from the mill. Periodic redressing also eliminates the need of removing several thousandths inches of stock to establish trueness. *From a release of B. S. Roy & Son, Worcester, Mass.*

Man-made Ice Bridge

BY LAYING POLYTHENE pipe over a bed of natural ice and using a refrigeration system, an artificial ice bridge was built over the North Saskatchewan river, northeast of Edmonton, Canada.

Before formation of the bridge, trucks carrying sand and gravel from the pits to stockpiles on the other side of the river had to go

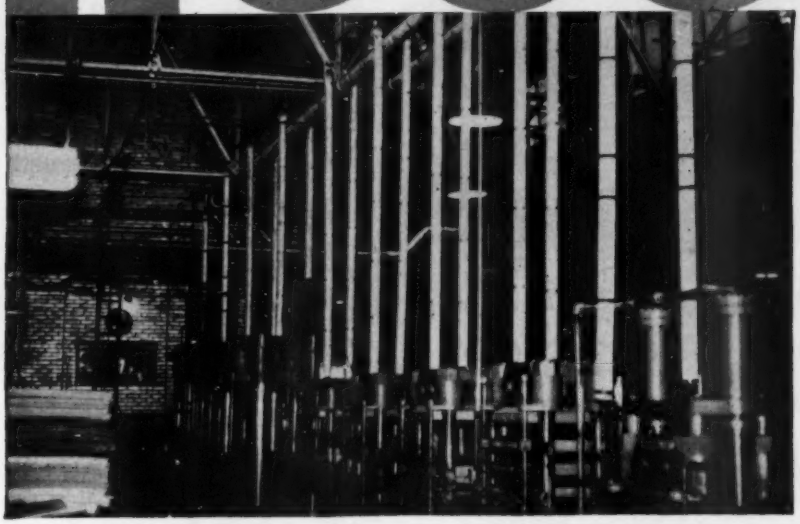
Artificial ice bridge across river was made for use of construction trucks.

ROSS Air Systems

Engineered Atmospheres for Better Processing

ROSS SUPERTHERM

UNIFORM
LOW COST
HEAT FOR
PROCESSING
AND SPACE



Section of the Supertherm System serving the presses.

The First Installation in the U. S. (1936) Still Proves its Economy and Efficiency for Providing Process Heat

Synthane Corporation, of Oaks, Pa., producers and fabricators of Laminated Plastics for Industry, installed the Ross-Supertherm High Pressure Hot Water System for providing *uniform* heating . . . and *uniform* cooling . . . to its presses and treating ovens. Cooling is included because the same medium serves for both heating and cooling.

Uniformity of heating and cooling is the key to consistently high end-product quality. Right from the start the Supertherm System provided this better than the previous steam system. It proved its economy after the change-over, too, because this system provided 26% greater efficiency than the good steam system previously in use.

The many users of the Supertherm System in the States and Canada get not only a more uniform heat at temperatures that can go to 400°F and beyond, but also a more economical heat. The process benefits and the economies are so attractive that anyone planning a new process or to use space requiring heat should investigate the Ross-Supertherm System. Likewise those who are dissatisfied with their present heating methods.

M-R

THE MIDLAND-ROSS GROUP OF COMPLEMENTING SERVICES

J. O. Ross Engineering, New York
John Waldron Corporation, New Brunswick, N. J.
Andrews and Goodrich, Boston
Ross Engineering of Canada Limited, Montreal
Ross Midwest Fulton, Dayton
Hoving Extruders, Mountainside, N. J.
Control Ross Engineering Company, Ltd., England

J. O. ROSS ENGINEERING

Division of Midland-Ross Corporation
730 Third Avenue, New York 17, N. Y.
ATLANTA • BOSTON • MT. PROSPECT, ILLINOIS
DETROIT • LOS ANGELES • SEATTLE

For more facts circle 534 on Reply Card

Speed maintenance via air... Gardner-Denver air and tools

Waste no time. Put Gardner-Denver air power and tools on your maintenance team. Fast-acting Gardner-Denver air tools help your crew make the most of maintenance hours. Impact wrenches • air hoists • paving breakers • trench diggers • sheeting drivers • backfill tampers • utility drills • grinders • ratchet wrenches • concrete vibrators • nut setters.

Compact Gardner-Denver rotary portable compressors provide a steady, dependable supply of low-cost air. Rugged drawbar makes Gardner-Denver rotaries easy to move. Jackleg provided for quick setting-up. Big toolbox for air hose and tool storage. Write for information.

Gardner-Denver RP85-G (85 cfm) rotary portable air compressor

Gardner-Denver RP125 (125 cfm) rotary portable air compressor

EQUIPMENT TODAY FOR THE CHALLENGE OF TOMORROW

GARDNER - DENVER

Gardner-Denver Company, Quincy, Illinois

In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Avenue, Toronto 16, Ontario

For more facts circle 535 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 46)

out of their way in order to use the only available bridge in the area.

This 8½-mile long route was shortened to five miles when the ice bridge was used. Had the bridge remained usable until all the gravel had been trucked, it would have represented savings of 600,000 ton-miles.

The river is 300 ft wide where the bridge was built. While the bridge itself was 150 ft long, the remainder of the crossing ran over ice thick enough to carry expected loads. The polythene pipe, which was chosen because of its flexibility in subzero temperatures and could be easily recovered, was looped in 300-ft lengths.

An ammonia refrigeration system was used to help keep the ice thickness at three feet; water was drawn from the river and sprayed on the ice.

During the three weeks the bridge was in use, it could support a 25-ton loaded truck. As many as 40 of these loads used the bridge daily until the ice "anchor" along the shore began to thaw. Then the refrigeration system was reversed to pump warm water through the polythene pipe which was afterwards removed to storage until next winter. *From C-I-L Oval, published by Canadian Industries Ltd., Montreal, Que., Canada.*

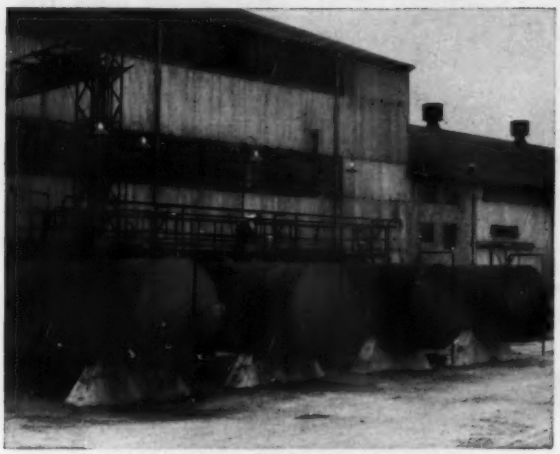
Wet Blasting Maintains Dies

WHEN WET BLASTING replaced degreasing, pickling and buffing in the maintenance of forging and forming dies at a forging plant,

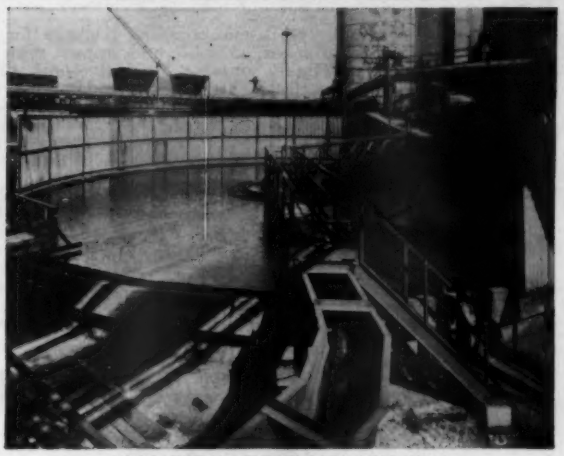
Steel die is cleaned by wet blasting.

Where's Your Toughest Corrosion Problem?

UNDERGROUND STEEL?



CHEMICAL SPILLAGE?



WASTE TREATMENT?

There's a time-tested TARMASTIC® coating to lick each one—economically and "for keeps!"

There's hardly a corrosion problem in your plant that can't be stopped dead-in-its-tracks with a Pitt Chem TARMASTIC coal tar coating. There are seven different Tarmastic coatings to select from. Each one is formulated to solve a specific type of corrosion problem.

These tough, heavy-duty coatings are so resistant to moisture and industrial corrosion that they'll outlast a dozen applications of ordinary protective paints. Yet they cost no more per gallon. Tarmastic coatings are readily applied by brush, spray or roller.

Begin cutting corrosion costs at *your* plant with a complete Tarmastic protection program! No other type of coating can do such a *complete* job of protection . . . at so *little* cost!

The first step is to call your local Industrial Distributor who handles Pitt Chem Industrial Coatings. Write for his name . . . or check the "Yellow Pages" of your telephone directory.

★ PITT CHEM "Insul-Mastic"® Gilsonite-Asphalt Coatings
★ PITT CHEM "Tarset"® Coal Tar-Epoxy Resin Coatings
★ PITT CHEM "Tarmastic"® Coal Tar Coatings

PROTECTIVE COATINGS • COAL CHEMICALS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON • FERROMANGANESE

For more facts circle 536 on Reply Card

NEW
Veeder-Root Counters

Count-PAK / SERIES 1661

Complete electronic counting package for use where high speed, long life and instant reset are required. Highly suitable for high speed direct counting applications such as can and bottle counting or case or piece counting on conveyor lines.

Consists of glow-transfer cold-cathode counting tube and high speed magnetic counter, coupled with transistorized circuits. Photohead designed to your application.

The use of transistors means that heat has been eliminated and no warm up time is required. Unit is completely enclosed in an attractive industrial case to insure long, trouble-free life. Use of an electronic decade increases the life of the electromechanical counter and makes the unit ideal for continuous rugged operation.

Write for complete specifications and prices today!

NEW SERIES 1522

High-Speed Predetermining Counter

Ideal for high-speed counting requirements such as coil winding, textile spinning frames, and other predetermining counter requirements.

Instant quick-lever reset, plus quick and easy setting of the predetermined number are outstanding features of this counter. Measures approximately 2.6" wide, 5" long, 2.8" high. Speeds up to 6,000 RPM or 8,000 CPM are maximums recommended.

Easily preset to the required number of pieces or performance-units, the counter subtracts to zero. Resetting returns wheels to original preset number. This new counter meets standard U. S. electrical requirements (JIC Codes) . . . and is available with either electrical switch or mechanical stop. Also available without the predetermining feature, as a high speed reset revolution counter.

Also available as a high-speed revolution counter without predetermining feature.

Write for complete information today!

Veeder-Root
INCORPORATED
HARTFORD 2, CONNECTICUT
Hartford, Conn. • Greenville, S. C. • Altoona, Pa. • Chicago • New York
Los Angeles • San Francisco • Montreal • Offices and Agents in Principal Cities

For more facts circle 537 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 40)

several benefits were then realized.

Cleaning time was reduced. For instance, a 300-lb steel forming die formerly required two hours for degreasing and buffing. Now, the die can be cleaned by wet blasting in 37 min. Use of this method removes no metal, so die life is increased. New dies of aluminum bronze alloy are wet blasted to achieve a more uniform finish than that obtained by buffing, assuring better lubricant and metal flow. *From a release of Techline Div. Wheelabrator Corporation, Vicksburg, Mich.*

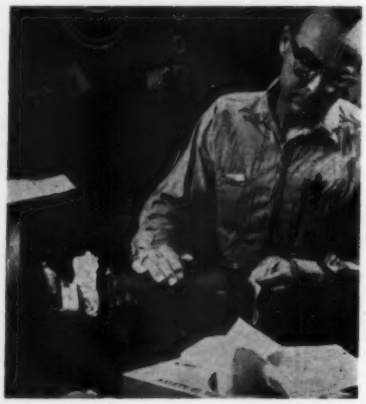
Hardboard Panels Protect Floor

A SIX-MONTHS' delay until a new concrete floor in its warehouse was properly cured, was avoided by the Union Lumber Co. of Fort Bragg, Calif., by covering the new floor with loose panels of ¼-in. hardboard.

This arrangement permitted use of heavy-duty tractors in the warehouse.

The tractors are used to haul heavy logs and finished lumber. Their sharp lugs and tracks would have permanently damaged the uncured cement, but the temporary floor provided complete protection. *From a release of Masonite Corp., Chicago, Ill.*

Paper Protects Stored Pumps



Paper wipers wadded in pump openings protect against infiltration of dirt during storage. (From a release of Scott Paper Company, Chester, Pa.)

Climate by Chrysler

erases $10,615 a year off the cost of erasers for Venus Pen & Pencil

Venus Pen & Pencil Corp. now produces better erasers—and saves $10,615 a year besides—by using a Chrysler Liquid Chiller to supply cool water for the rolls used in calendering the rubber.

The rolls must be kept from overheating to prevent discoloration or damage to the rubber. Venus Pen & Pencil had been using city water in its Lewisburg, Tenn., rubber plant. Water costs ran nearly a penny per pound of processed rubber. And, since water temperature rose too high in summer, 10% of its production was wasted.

The Chrysler Liquid Chiller solved the production problem by keeping recirculated water at a constant 50° F. Eraser quality improved . . . and $9,000 worth of waste rubber per year was eliminated. Water costs were cut almost 75%—saving $3,550 annually. And maintenance costs on the rolls dropped $500. Net savings of $10,615 in the first year practically paid the entire cost of the Chrysler Liquid Chiller installation.

Where chilled water is required for cooling a process, or cooling for comfort, Chrysler equipment offers many exclusive advantages: Hermetically sealed Radial Compressor, innerfin direct expansion chiller, lower installation and maintenance costs. Get the complete story and technical data from your local Chrysler Applied Machinery and Systems sales office. Or write: Airtemp Division, Chrysler Corp., Dept. V-89, Dayton 1, Ohio. In Canada: Therm-O-Rite Products, Ltd., Toronto, Ontario.

CHRYSLER AIRTEMP

FIRST WITH THE FINEST IN AIR CONDITIONING

For more facts circle 538 on Reply Card

can save up to 40% on many pressure gauge applications

Analyzed your gauge needs lately—how much gauge performance you're getting, compared to what you need and what you pay for? Perhaps it's time for a closer look at United States Gauge with its line of 50,000 standard pressure gauges, plus specials (and all possible choices in case styles, sizes, materials and pressure ranges). For example, note how you can save up to 40% on premium gauges and still get premium performance with the USG A-Line *(top, right)*. Note, too, how you can get the exact gauge for *any* need and cut waste of under-buying or "over-gauging" . . . from all the gauge lines available at this one source. Then check the USG distributor listed in your Yellow Pages. Or write direct for catalogs and name of your nearest distributor today.

Paying needless premium prices for reliability? USG A-Line pressure gauges have premium construction, save up to 40% on premium prices. Meet A.S.A. Grade A standards, including 1% accuracy. Extra rugged, they are built to *deliver* longer under severe operating conditions, where you do not require the accuracy of Grade AA gauges, but where reliability and cost-cutting are "musts". Wide choice of Bourdon tubes, case styles and sizes, pressure ranges, and movements. You must see the sturdy design and price to believe the value and performance. Models for general-purpose service, altitude, refrigeration, ammonia and hydraulic applications. *Write for Catalog 305.*

Buying too much gauge for your purpose? Save with volume-priced, precision-built USG Drawn Case Gauges for service where your gauge need calls for A.S.A. Grade B standards, including 2% accuracy. *Write for Catalog 64A.*

Getting all the accuracy you're paying for? You can't buy more precision than with USG Test Gauges which meet or exceed A.S.A. Grade AA standards, including accuracy as high as 0.2 of 1%. *Write for Catalog 400.*

UNITED STATES GAUGE
Division of American Machine & Metals, Inc., Sellersville, Pa.

Find Your Nearest Distributor in the "Yellow Pages"

For more facts circle 539 on Reply Card

For more facts circle 540 on Reply Card →

another G-E

8000

development

GENERAL ELECTRIC ANNOUNCES . . .

New Custom '8000'* Motors

PROJECT '8000' . . . a major General Electric program of research, redesign, advanced manufacturing and improved customer service on A-c motors 150 to 6000-hp.

*Trademark of General Electric Co.

CUSTOM DESIGNED . . . New General Electric Custom '8000' motors are built specifically to meet your requirements. Selecting from specially designed enclosures, advanced insulation systems, custom-designed end shield and bearing constructions, and more than 15 custom-designed accessories—plus a countless number of electrical designs—General Electric engineers will create a motor to meet exacting needs, provide initial and continuing economy, and give long, reliable service. Turn page for features of new Custom '8000' motors.

NEW CUSTOM '8000' MOTORS GIVE TOP PERFORMANCE WITH LESS MAINTENANCE . . . HERE'S WHY

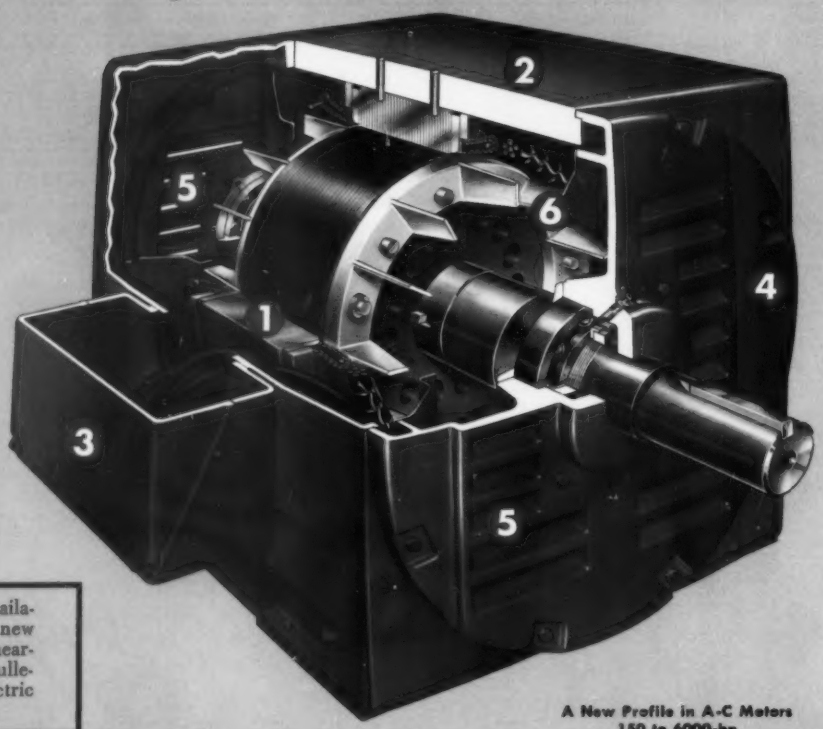
GENERAL ELECTRIC

FROM GENERAL ELECTRIC . . .

another G-E 8000 development

NEW Custom '8000'* Motors Give Greater Reliability Require Less Maintenance

1. **LONGER INSULATION LIFE**—Pre-wound core allows closer quality control and gives longer insulation life through improved varnish impregnation or silicone rubber encapsulation.
2. **BETTER CONSTRUCTION**—Cast iron frame withstands 20G simulated transportation shock tests; resists corrosion.
3. **FASTER INSTALLATION**—Conduit box has up to 3 times volume of ordinary boxes; lifting lugs, cast to frame, hold up to 12 times motor weight.
4. **EASIER MAINTENANCE**—Flat end shields are more adaptable to addition of accessories or modifications; are lighter—easily handled by one or two men.
5. **BETTER COOLING**—Double-end ventilation, new duct design and louvred air openings provide more efficient air distribution through motor, reduce hot spots.
6. **LOWER NOISE LEVEL**—Sound power has been cut up to 50% by redesigning frame sections, rotor fans, air deflectors and intakes.



A New Profile in A-C Motors
150 to 6000-hp

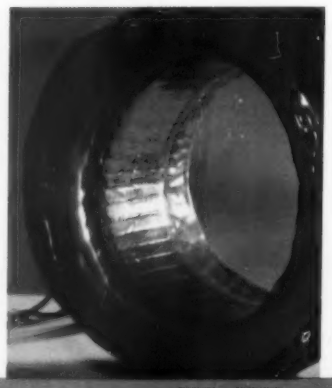
FOR COMPLETE INFORMATION and availability dates about General Electric's new Custom '8000' motor line, contact your nearby Apparatus Sales Office, or write for bulletin GEA-6865, Section 884-2, General Electric Co., Schenectady, N. Y.

NEW *Polyseal** SILICONE RUBBER INSULATION SYSTEM IS AVAILABLE ON CUSTOM '8000' MOTORS

Silicone rubber used in Polyseal insulation systems is a product of General Electric's Silicone Products Dept., Waterford, N. Y. . . . a leader in research, development, and manufacture of silicone materials. Supported silicone tape is a development of General Electric's Insulating Materials Dept., Schenectady, N. Y. Combining silicone rubber with dacron-glass supporting materials is a major engineering advancement, giving this material both the mechanical and dielectric strength required for use as a motor insulation. Polyseal insulation systems are available *only* on General Electric motors. Medium AC Motor & Generator Dept.

FORM-WOUND MOTORS

Polyseal supported silicone rubber insulation system provides greater mechanical, thermal, voltage and environmental endurance than unsupported silicone rubber. Glass fabric materials are imbedded in each layer of silicone tape, which, after coil wrapping is vulcanized under heat and pressure to seal the system against moisture and contaminants. General Electric form-wound open motors with Polyseal insulation system can be used in some severe atmospheres formerly reserved for totally-enclosed motors.



RANDOM-WOUND MOTORS

Polyseal silicone insulation system offers greater flexibility and better heat transfer than existing encapsulations . . . it operates effectively from —90C to 200C and will not crack under excess thermal cycling or severe moisture. After receiving G.E.'s standard random-wound insulation treatments, Polyseal insulation is applied to stator and end turns, completely sealing windings with a thin, waterproof, inert covering which protects against extreme moisture, most chemical fumes, dust and corrosion.

*Trademark of General Electric Co.

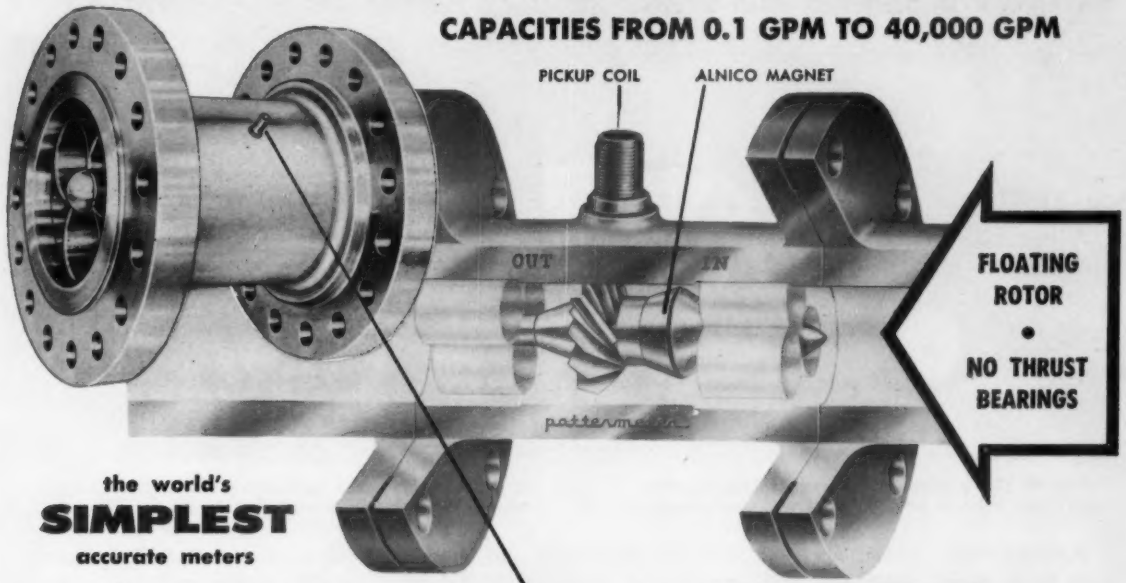
Progress Is Our Most Important Product

GENERAL ELECTRIC

pattermeter BOWSER ESTABLISHED 1045

INLINE ELECTRONIC TURBINE TYPE METERS

CAPACITIES FROM 0.1 GPM TO 40,000 GPM

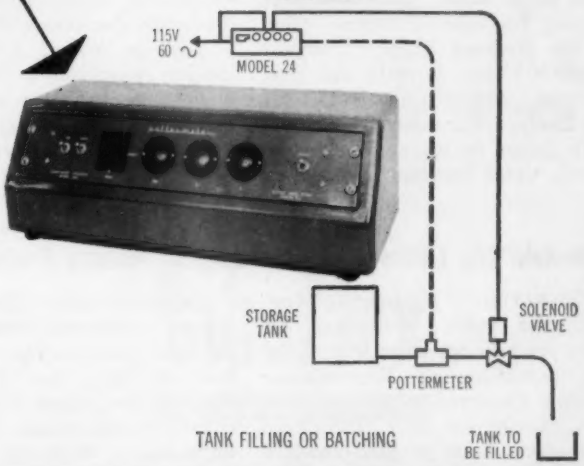


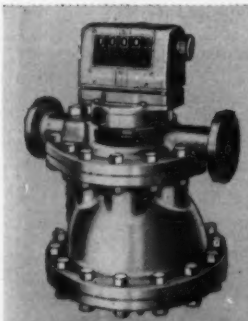
the world's SIMPLEST accurate meters

An Alnico magnet in the turbine rotor generates electric current directly proportional to the flow rate in the pipe. This activates readout or control equipment located at or remote from the Pottermeter unit.

PROVIDES BASIC INSTRUMENTATION FOR ANY AUTOMATION SYSTEM

Operating by gravity or pump pressure, Pottermeters are available in all pipe sizes. Electronic totalizers, recorders or controllers meet any need for automated liquid process or transfer operations. Potter-Bowser sales engineers in principal cities confer promptly with systems or plant engineers to detail availabilities and application data.





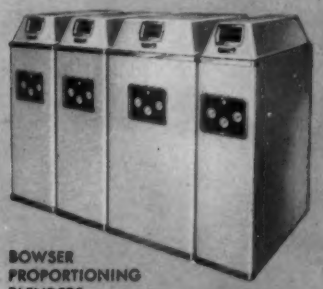
BOWSER XACTO METERS

BOWSER XACTO METERS AND PROPORTIONERS

positive-displacement piston type

Wherever mechanically driven readout and control equipment is indicated, and where positive-displacement metering is needed or costs less, Bowser Xacto Meters (leading all others in industry) are unexcelled for dependability and accuracy. Capacities: 6 GPH to 250 GPM

Xacto Meter equipped proportioners are used to blend two or more liquids in continuous flow at accuracies to ¼ of 1 percent. First in lube oil blending, Bowser proportioners also handle most other liquids used by process industries.



BOWSER PROPORTIONING BLENDERS

Write For Catalog

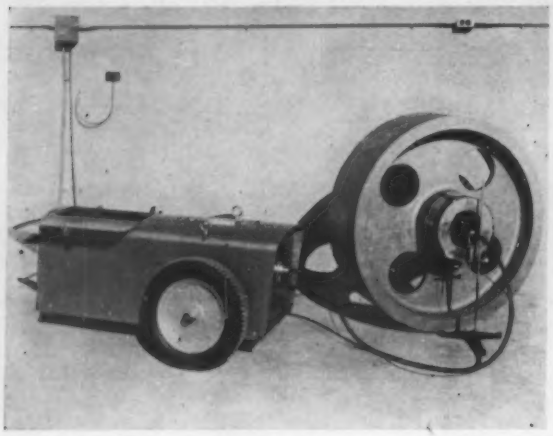
Potter-Bowser Division BOWSER, INC. Fort Wayne, Indiana

For more facts circle 541 on Reply Card

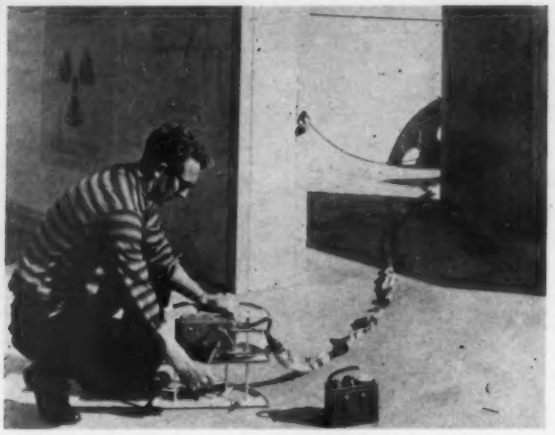
OPERATION AND PRODUCTION —pointers for the industrial plant engineer

Edited by Vern Kempf

Mobile Carrier for Radioactive Cobalt 60 Makes Radiographic Inspection Safe



Cobalt 60 pill is propelled through tubing to point of use inside hub. Film to be exposed is wrapped around the hub.



Remote control of the radioactive pill is provided by this portable control unit placed outside thick concrete walls.

RADIOGRAPHIC INSPECTION has been made easier, faster and safer in the Torrance, California plant of the National Supply Company where it is used to make sure steel castings, forgings and weldments are flawless. These advantages have been gained by means of a mobile carrier which provides remote control for positioning and retracting radioactive cobalt 60 from behind protective concrete walls.

Built to Atomic Energy Commission specifications, the enclosure has concrete walls 18 in. thick and seven feet high. Large parts can be carried into the enclosure by truck or lifted over the wall with a truck-crane outside the enclosure.

The mobile unit has a flexible projector tube in which the cobalt 60 pill is guided to the point of use from a lead storage safe. The control unit is mounted on the end of a long flexible metallic cable which is unreeled to a safe distance outside the walled enclosure.

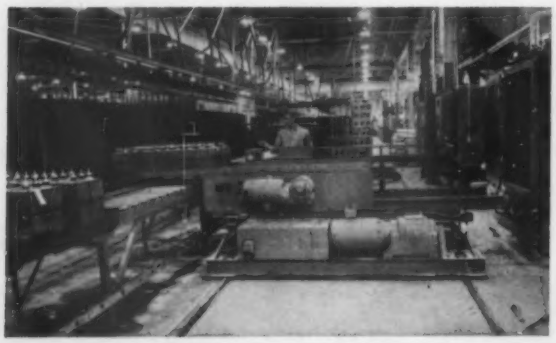
Semi-Automatic Electro-Hydraulic Transporter Reduces Product Handling

OPERATED BY one man, a semi-automatic pallet transporter has been put into operation in processing capacitors at Westinghouse Electric Corporation, Bloomington, Ind. Moving on floor tracks, the unit serves three parallel banks of vacuum ovens and impregnators.

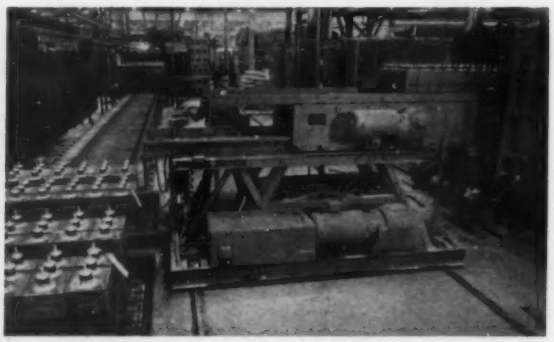
Capacitors arrive from the testing area and are banded together on steel pallets. The transporter, built by The Colson Corporation, receives the pallets from a roller conveyor and moves them to an impregnator. While one pallet load is being processed, the unit continues in operation, removing or loading another pallet from an oven, impregnator or conveyor, depending upon the processing cycle.

Each of the three banks consists of two impregnators and one oven. In serving them, the transporter is

(Continued on page 58)



Transporter lifts pallet load of capacitors from conveyor.



Pallet is lifted and rolled across aisle into waiting oven.

This is a 1½" Teflon* hose, actual size, bending to

A DIAMETER OF 6¾" AT −65° F!

Impossible to produce? TITEFLEX did it, and only TITEFLEX has it! Industry's idea of what flexible Teflon hose in large diameters *can* and *cannot* do has changed overnight.

THESE ARE THE FACTS:

- Minimum bend radius is only 3½ times diameter! Available up to 2 inch diameter, lengths to 25 feet.
- It has all Teflon's important features: fatigue life sets endurance records... it's tough, friction-free, light, inert, highly resistant to corrosion and extreme temperatures.
- Teflon innercore is convoluted by exclusive process, and reinforced with TITEFLEX heavy-duty wire braiding.
- Seal faces pressure tight. Braid, innercore and fittings are made practically one by the TITEFLEX method.

Already Springfield "400" is in use for live steam, alcohols, methanol and corrosive fluids. New uses for the toughest jobs are found every day... how about your operation? Get a copy of our bulletin from your TITEFLEX Distributor (in the Yellow Pages). Or drop us a line.

titeflex

titeflex inc. springfield mass. PACIFIC DIVISION • SANTA MONICA • CALIFORNIA

*T. M. of duPont
**T. M. of Titeflex, Inc., Pat. Pend.

For more facts circle 542 on Reply Card

OPERATION — PRODUCTION

(O and P begins on page 56)

automatically positioned at the various stations and levels after the operator has activated the necessary control. Electric and hydraulic controls power the traverse, lift, side shift, roll-on and roll-off motions. The operator rides along with the unit when it is in operation.

Lift capacity is 3000 lb. Lift speed is three feet per minute and traverse speed is 31 fpm.

Viewer Solves Inspection Problem

JOB TRAINING of bearing inspectors ordinarily takes two weeks at the Timken Roller Bearing Company. During this time the trainee rarely has the opportunity to see all the maximum passable defects that can occur in bearings, cups, cages and rollers. Sets of standard samples that show all the possible defects are difficult to obtain. Once selected they rust, discolor or can be misplaced and the selection of samples must be done all over again.

The problem of maintaining standard samples and insuring uniform inspection procedures at all five manufacturing plants has been solved through the use of a three dimensional viewer. Imported from Germany, the viewer cost approximately $15 and will hold about 50 frames showing various samples. A continuous strip of transparencies is used and the operator can bring any sample into view rapidly. Cost of preparing the first strip runs around $200 but duplicates can be made for $30 each.

Taking the 3-D photographs of the samples is accomplished with a 35 mm camera equipped with a reflex attachment. A sample part is placed on a light box illuminated from beneath by a circular fluorescent light. A hood over the light box results in almost shadowless lighting. The glass of the light box is covered with a sheet of vellum to diffuse the light.

Attached to a mount that is pivoted directly under the subject, the camera can be shifted to the right or left so that pairs can be taken. The degree of shift is determined by the focal length of the lens and the lens-to-subject distance.

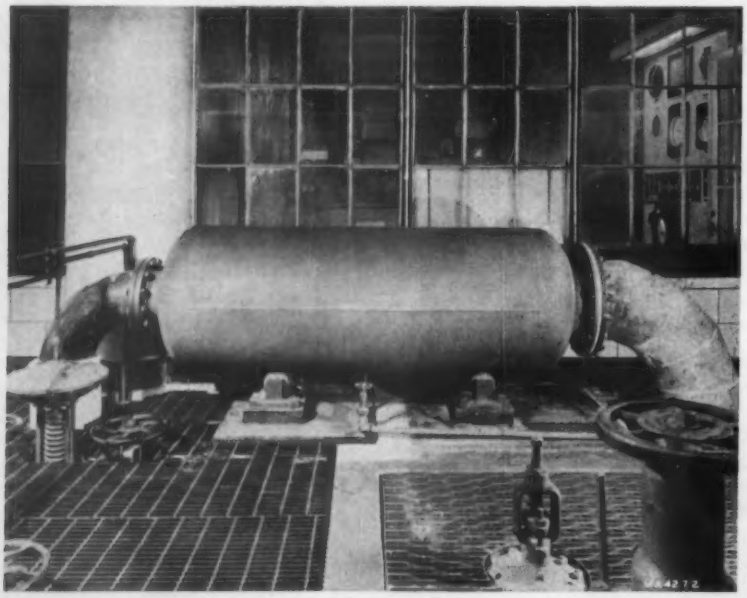
Inspector compares questionable bearing with maximum passable defect permitted as shown in film strip viewer.

First a master shot from the right position is taken. Next a series of left negatives is shot by gradually shifting the camera, on its mount, to the left and making several different exposures. The processed negatives are then placed in a viewer with the right hand negative placed in position.

By substituting the different left negatives, the one providing the best 3-D effect is selected. The same degree of shift to the left is used for a whole series of shots as long as the lens-to-subject distance and the focal length of the lens remains the same.

Using a device that simulates the 3-D viewer, the right negative is positioned on a base of opaque paper and the left negative matched to it. A final roll of positive transparencies can be made as long as needed. When completed, the standard sample films are sent to all plants to insure uniform quality standards.

Pressure Reducing Snubber Silences Noisy Steam Line



Connected to two six-inch pressure reducing valves, a 16-in. steam header at the Olson Rug Company plant, Chicago, had been a noisy nuisance for some time. Handling a maximum flow of 80,000 lbs/hr of steam, the valves reduce pressure from 150 psi to 12 psi for plant use. Installation of a Burgess-Manning silencer downstream of the pressure reducing valves has reduced the noise to a low level.

Fire Hose Resists Chemicals

FOLLOWING four years' use of fire hose jacketed with Dacron polyester fiber, the Fortier plant of American Cyanamid Company has decided to replace all of its cotton hose on a wear-out basis with single-jacketed hose of Dacron impregnated with, and over a core of, neoprene. Plant officials base their decision on the greater dependability, superior performance and potentially longer life of the hose, demonstrated during the test period.

Plant Fire Chief L. M. Byrd has found hose of Dacron to be unaffected by acid spills, chemical

For more facts circle 543 on Reply Card ⟶

Why Hunter Packing Company uses STANOIL Industrial Oil

Two reasons: (1) STANOIL is a superior oil. (2) Along with STANOIL, Hunter Packing receives experienced lubrication technical service.

A special antioxidant in STANOIL gives the oil resistance to *chemical* change. Deposits are minimized. The oil has a high viscosity index, is resistant to *temperature* change. It lubricates effectively at both high and low temperatures. Due to special refining techniques, STANOIL will not readily emulsify. A special additive minimizes foaming. STANOIL has a low pour point. It flows freely at low temperatures. A rust inhibitor in STANOIL "plates out" on metal surfaces.

W. P. "Sandy" Wehking, the Standard Oil man who calls on Hunter Packing Company, has plenty of experience in technical service work. He's been at it for 17 years. Sandy studied chemistry at Blackburn College. He has also completed the Standard Oil Sales Engineering School.

To get more information about STANOIL Industrial Oil and to obtain technical help on your lubrication problems, call the Standard Oil office near you in any of the 15 Midwest or Rocky Mountain states. Or write, **Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.**

Quick facts about **STANOIL Industrial Oil**

- Antioxidant gives oil resistance to chemical change, minimizes deposits.
- Inhibitor "plates out" on metal surfaces, prevents corrosion.
- Receives special refining to eliminate emulsion problems. Contains additive to minimize foaming.
- High viscosity index. Resists temperature change.

You expect more from STANDARD *and you get it!*

Temperature check. Frank Persson of Hunter Packing Company and Standard Oil lubrication specialist W. P. "Sandy" Wehking inspect one of four compressors in Hunter plant that uses STANOIL Industrial Oil.

PROGRESS IN POWER TRANSMISSION CHAIN DESIGN

In 1953...

Whitney introduced the first oil-impregnated, sintered steel bushing roller chain — a major advance in chain design.

Not content with leading the field with the first sintered bushing chain, Whitney Engineers continued their exhaustive field research . . . carried on searching studies of the original sintered bushing chain in an effort to produce an even better chain with optimum performance characteristics. Their work, coupled with recent developments in sintering technology, resulted in the development of MSL Chain—a completely new concept in power transmission chain.

Today...

WHITNEY MSL® CHAIN . . . a product of continuing Whitney Research—is another giant step forward in chain technology because it advances and improves on the basic idea of oil-impregnated, sintered steel bushings in power transmission chain.

Only Whitney MSL Chain with oil-impregnated bushings assures complete built-in lubrication at all three critical lubrication areas:

1. **Pin**—Protective film of oil completely lubricates the live bearing area between pin and bushing, minimizing wear by reducing metal-to-metal contact.
2. **Plates**—Whitney oil-impregnated sintered steel bushings extend beyond surface of inside plates to act as lubricated thrust bearings, control clearance, and provide an oil cushion between plates, eliminating plate galling and seizing frequently caused by misalignment of sprockets.
3. **Sprocket Engagement**—MSL Chain does not require rollers, as the tough oil film on the bushing surface provides smooth sprocket engagement, cushions impact and reduces drive wear.

Inherent material characteristics of Whitney sintered steel bushings, plus bushing configuration that provides greater contact area between bushings and links, permit high interference fit, which pre-loads links and gives maximum fatigue resistance.

Whitney MSL Chain meets ASA Standards

It is made in Standard and Extended Pitch types, and is completely interchangeable with any similar pitch ASA Standard chain. For full details, write for MSL Catalog G1-50, or call your nearby Whitney Chain Distributor, who carries MSL Chain in stock for quick delivery.

***Maximum Service Life**

Whitney

Advanced Design is a Whitney Tradition

CHAIN COMPANY

A Subsidiary of Foote Bros. Gear and Machine Corporation

4583 S. WESTERN BOULEVARD
CHICAGO 9, ILLINOIS

For more facts circle 544 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 56)

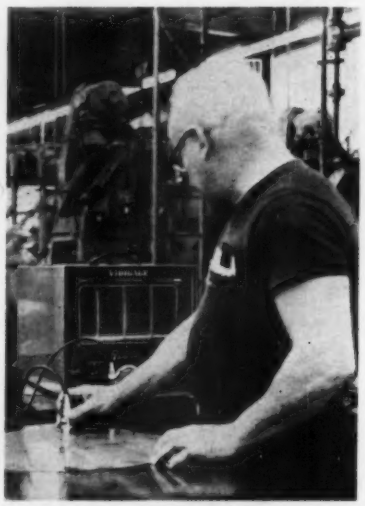
fumes and mildew. These are important advantages in a chemical processing plant.

From the standpoint of cost performance, the fire chief believes that the new hose may prove less expensive than double-jacketed cotton hose. While the initial cost of Dacron is higher than cotton, plant management feels its resistance to chemical attack and potentially longer life justify the increased investment.

Sonic Testing Reduces Rejects

NON-DESTRUCTIVE testing of laminated blanks using an ultrasonic resonance gage is saving Bridgeport Brass Company, Bridgeport, Conn., hundreds of dollars by providing a test method that is simple, fast and reliable.

Used in a new line of kitchen-

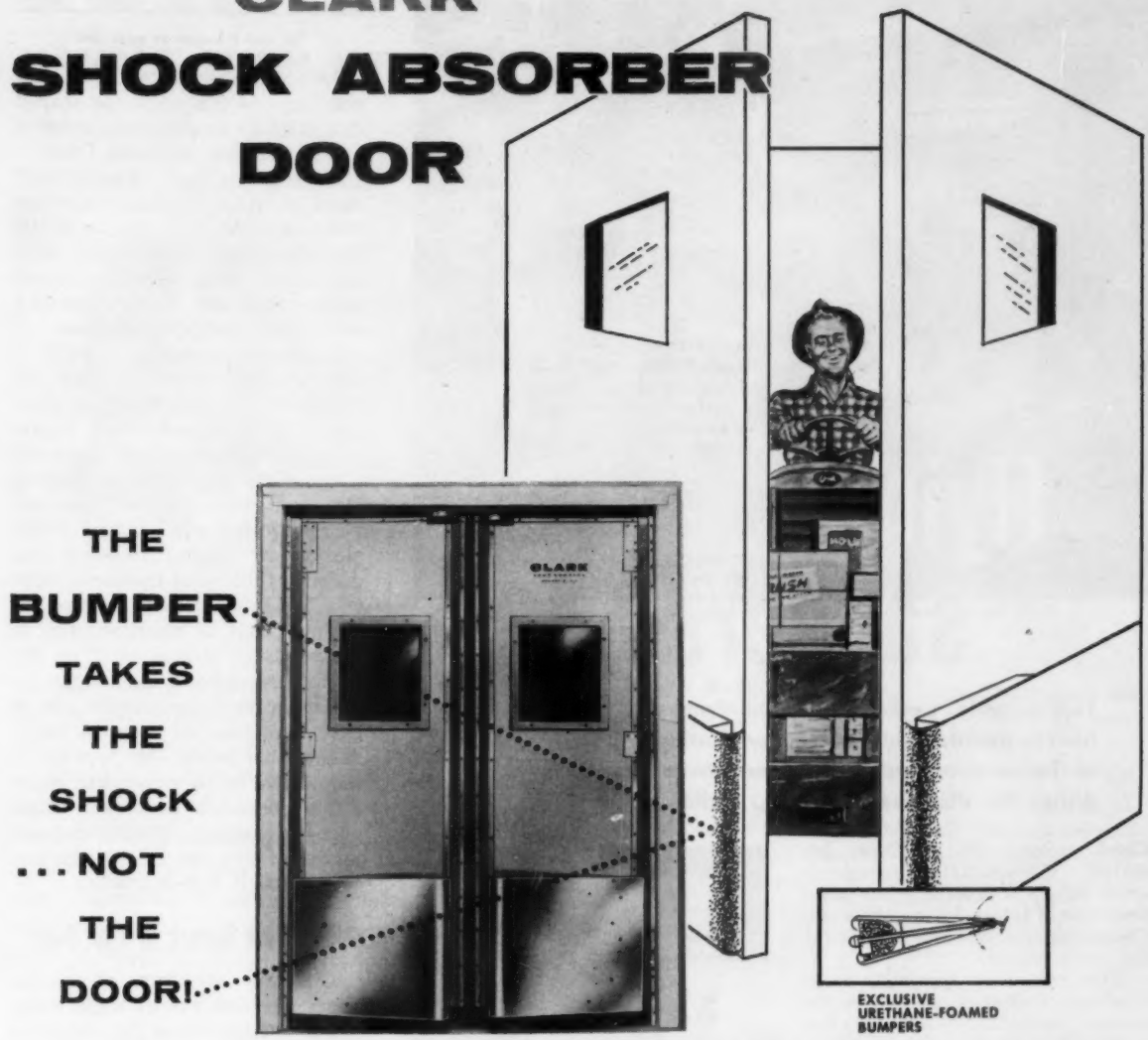


Operator places probe on blank, watches the traces on cathode-ray tube.

ware, the rim-to-rim laminated structure has an inner copper core protected by two outer stainless steel skins. The copper layer is laminated beween the two disks of stainless, the finished blank is then formed by a press and buffed to a high gloss.

If there were any discontinuity in the bond, the blank may delaminate during drawing or the defect may

NEW CLARK SHOCK ABSORBER DOOR



... won't rip, warp, or come off the fastenings

This is it! The Bump Door that keeps your traffic *moving;* withstands *hundreds of thousands* of openings without wear, tear or repair.

Constant pounding by heavily laden fork trucks can't weaken the hinges, the frame or the door itself. Because the trucks *never touch* the door.

Full impact is absorbed by the resilient URETHANE-Filled Bumpers. Hinges stay put because stress is uniformly distributed, thanks to flexible suspension. Guaranteed Spring Return assures tight closure. Neoprene seals at the door's periphery eliminate drafts and unwelcome noises.

Surprisingly low in cost, the CLARK Shock Absorber Door comes in a complete easily installed unit. No extras to buy. Available in all standard sizes.

Get the full story on this dynamically different self-closing door. Write today, specifying size of door opening.

CLARK DOOR COMPANY, INC.

(SINCE 1878)

507 Hunterdon St. Newark 8, N. J.

For more facts circle 545 on Reply Card

flying saucers!

Two reliable, packaged Cleaver-Brooks boilers maintain high-speed production of Texas-ware and Dallas-ware melamine dishes for Plastics Mfg. Co., *Dallas*

Chief engineer, W. L. Cone, Jr., states: *"Consistently dependable steam supply is keynote of our plant operation. That's why we chose two Cleaver-Brooks gas-fired boilers for our steam source.*

"One feature we appreciate about these new boilers is the easy access to their internals. Not only does this facilitate frequent inspections but also it greatly reduced their cost. There are no joints that require re-sealing every time the boiler is opened. Being hinged and davited, the doors and heads do not have to be hoisted for removal. Six bolts can be removed in less than two minutes."

Guided by experience

"Based on nine years of unfailing performance delivered by two 50-hp Cleaver-Brooks boilers we used in our former plant, there never was any question that we would install their equipment in our new plant," said Mr. Cone.

Architects for the new plant were: Thomas, Jameson and Merrill; Consulting engineers: Zumwalt and Vinther; General contractor: Carpenter Bros.; Mechanical contractor: Beard Plumbing Company, all of Dallas.

"Our 125-hp, 250-psi design pressure, gas-fired Cleaver-Brooks boilers provide all steam for compression-molding presses, office space heating and hot water heating" — W. L. Cone, chief engineer.

Cleaver-Brooks packaged boilers are America's largest selling packaged boilers. Available in 19 sizes, 15-600 hp, 15-250 psi. Oil, gas or combination oil/gas fired. For complete information contact nearest representative or write: Cleaver-Brooks Co., Dept. J, 364 E. Keefe Ave., Milwaukee 12, Wisconsin, U.S.A.

Originators and largest producer of packaged boilers

Cleaver Brooks®

For more facts circle 546 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 56)

show up as a streak or blister after polishing. At this point, the shaped disk must be scrapped, representing a loss of much time and labor.

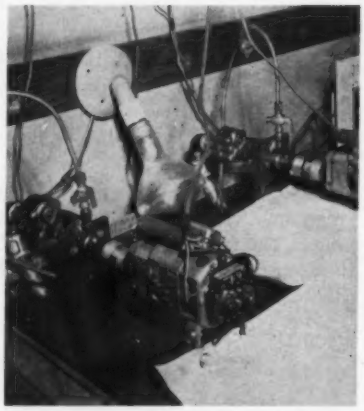
To reduce these losses, each blank is now inspected with an ultrasonic resonance gage, made by Branson Instruments, Inc., after laminating. Each blank is coated with a thin film of glycerine for good sonic energy transmission.

A quartz transducer is held to one surface of the blank. When this transducer is excited by an electronic sweep oscillator, the crystal vibrates over a range of frequencies, transmitting continuously varying ultrasonic waves into the material. At a frequency equal to or a multiple of the natural resonant frequency of the metal thickness, there will be a considerable increase in the amplitude of vibration. This is indicated by vertical lines on the cathode-ray tube of the tester.

Any internal discontinuity will, in effect, decrease the apparent thickness at that point. This appears on the screen as an incomplete trace, a total absence of traces or a difference in spacing. Testing requires access to only one side of the material, and is non-destructive.

Pumps Test Motors at Low Cost

COMMON METHODS of loading generators and motors while under test in the laboratory are resistance

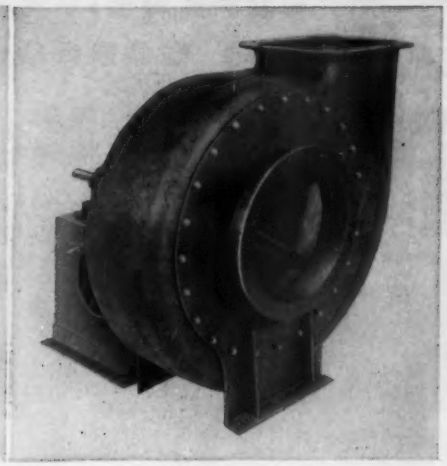


Test stand using hydraulic pumps provides variable load to test small motors.

CORROSIVE FUMES?

HANDLE THEM WITH THESE SPECIAL "BUFFALO" FANS

"Buffalo" Cast Iron Exhauster



"Buffalo" Fiber Glass Fume Fan

"Buffalo" Cast Iron Exhausters are built to withstand extreme corrosive conditions in the chemical process industries. High efficiency is the result of low-turbulence air flow design. This includes heavy-duty cast iron housings and cast inlet cones with integral inlet vanes. Non-overloading characteristics are preserved despite changes in system pressure. Available with direct motor drive, separate belt drive or package unit with adjustable pitch V-belt drive and motor mounted on adjustable base rails. Write us for full information.

"Buffalo" Resin-Bonded Fiber Glass Fume Fans are highly resistant to such chemical corrosives as acids, salts, gases, organic materials and others. They are suitable for temperature applications up to 300° F. The fan housing is constructed entirely of fiber glass. All exposed parts of the factory-balanced rotor are encased in thick fiber glass. Standard capacities range up to 34,000 cfm at pressures to 10" static. Investigate the advantages of "Buffalo" Type "FG" Fume Fans—versatility, lighter weight, reasonable cost, dependability. Write for Bulletin FI-511.

These two specialized fans are representative of the air handling units engineered by the Buffalo Forge Company to help you combat the corrosive fumes encountered in many industrial processes. In addition to these fans, "Buffalo" offers rubber lined fans, fans with other special coatings and a comprehensive line of air cleaning units.

For complete details on "Buffalo" corrosive fume handling units, contact your "Buffalo" engineering representative or write us direct.

BUFFALO FORGE COMPANY
BUFFALO, NEW YORK
Buffalo Pumps Division, Buffalo, N. Y.
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

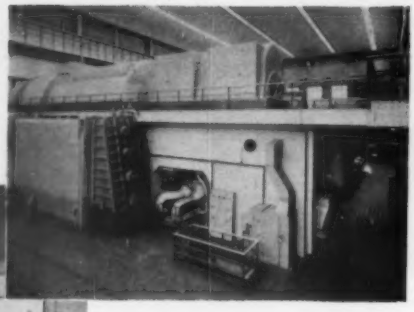
VENTILATING • AIR CLEANING • AIR TEMPERING • INDUCED DRAFT • EXHAUSTING • FORCED DRAFT • COOLING • HEATING • PRESSURE BLOWING

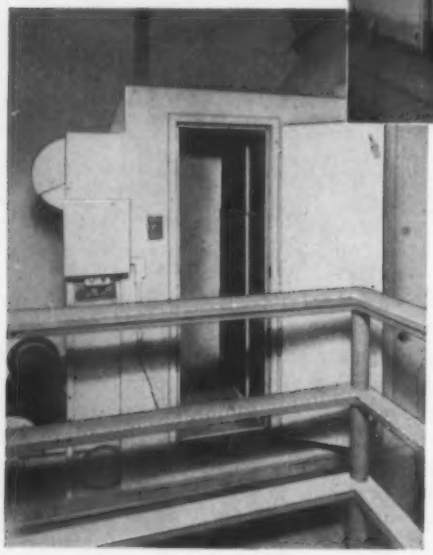
For more facts circle 547 on Reply Card

HOW CONNOR dorex® *Protects*

EXPENSIVE EQUIPMENT AGAINST CORROSIVE GASES

At the Linden Generating Station of Public Service Electric and Gas Company, Newark, New Jersey, Dorex Air Purification equipment protects the collector rings of the station's large generators from corrosive gases.





Two Dorex installations of six cells each prevent a destructive condition which would cause frequent, costly replacement of brushes and rings.

And in many other utility stations and industrial plants, Dorex guards expensive equipment against such destructive, contaminated gases as sulfur components, organic peroxides, nitrogen oxides, and chlorides . . . and protects personnel.

Dorex acts just like a gas mask, using activated carbon to adsorb air-entrained pollutants. The carbon's purging action purifies the air and readies it for sanitary re-use. Dorex is easily adapted to new or existing duct systems, requiring no more engineering than that necessary for similar incorporation of standard dust filters.

Request new Dorex Bulletin 108A, and ask to have a Dorex representative call . . . Dorex equipment can be the efficient, economical solution to your air pollution problem.

CONNOR... for Constant Comfort Conditions

CONNOR ENGINEERING CORPORATION

DANBURY • CONNECTICUT

CONNOR ENGINEERING CORPORATION dorex® air recovery

For more facts circle 548 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 56)

grids and dynamometers. The loading back method, whereby two machines are coupled together, one as a motor and one as a generator, is also quite commonly used. Frequently other methods are needed to test for certain characteristics.

As an example, consider the unusual problem of testing a 115-v, 150 watt business machine motor. The requirements are a loading system that will provide a surge current of short duration, cause the machines to coast quickly to a stop and repeat on a cycle of ¾ second "on" and ¾ second "off".

To solve this loading problem, J. C. Copella and M. S. May, Carbon Products Division, Speer Carbon Company, used oil pumps from lift trucks. A test stand was built to directly couple each motor to an oil pump that would circulate SAE 20 oil from a reservoir.

Loading was varied by changing the setting of a pet cock in the discharge side of the line. This worked very well until it was noted that during cold nights the machines were more heavily loaded because the viscosity of the oil changed as room temperature varied.

To correct this an infrared heat lamp, placed above the surface of the oil in the reservoir, was thermostatically controlled by the temperature of the oil.

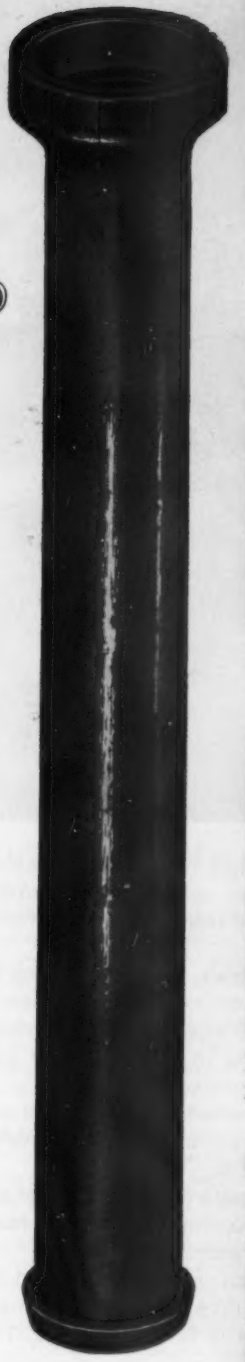
Magnetic Rolls Reduce Slipping

PERMANENT MAGNETIC rolls are being used at the Rheem Manufacturing Company, Inc., Linden, N. J., to convey wet painted sheets used in the manufacture of steel shipping containers. The positive holding power of the magnetic rolls reduces damage to wet sheets emerging from the discharge end of coating machines.

Function of the magnetic rolls is to convey the sheets, ranging from 16 to 26 gage and 44 in. by 72 in. in size, out of the coating machines and feed them to wickets which carry them through the oven. Since these sheets come directly from lithographic presses, the leather belts previously used caused slip-

NOW A GLASS LINED CORROSIVE RESISTANT VITRIFIED CLAY PIPE

AMVIT JOINTED GLAS-GLAZ



Here's a new product that has everything:

- VITRIFIED CLAY PIPE IN LONGER LENGTHS
- THE FACTORY MADE, MECHANICAL AMVIT PLASTIC JOINT
- GLASS LINED INSIDE AND OUT
- COSTS NO MORE THAN ORDINARY PIPE
- CORROSIVE AND ACID RESISTANT

You can make important savings in first costs and in operating costs with remarkable new Glas-Glaz pipe. It has everything, is quick and easy to install, and will outlast other materials. This low cost, superior product is available due to new manufacturing techniques and research developments.

LOWER MATERIAL COSTS — Glas-Glaz costs substantially less than metals, alloys, or lined materials commonly used for corrosive service.

LOWER INSTALLATION COSTS — Glas-Glaz can be installed quickly and easily. The joint, made from plasticized resins of polyvinyl chloride, is on the pipe delivered ready for installation. All you do is push the ball and socket together.

LOWER MAINTENANCE COSTS — Glas-Glaz is acid resistant, resists abrasions and corrosion, will not rot, rust, or deteriorate.

Plant and process engineers can specify Glas-Glaz and *be sure of performance.* It's the only clay pipe designed for industrial and commercial use wherever highly corrosive wastes are encountered.

Write for a descriptive folder now.

SINCE 1848

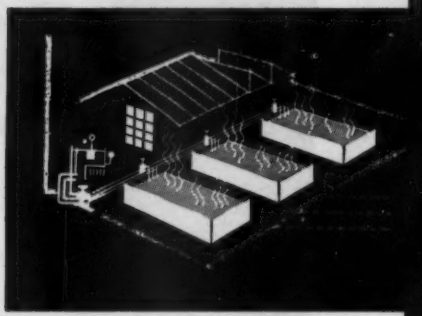
AMERICAN

American Vitrified Products Company

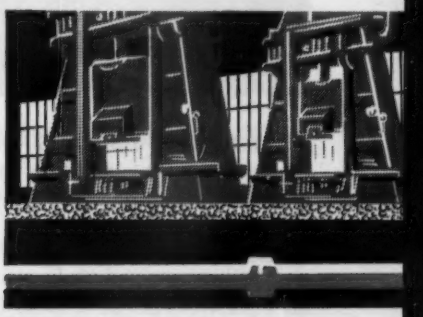
NATIONAL CITY BANK BUILDING
CLEVELAND, OHIO

For more facts circle 549 on Reply Card

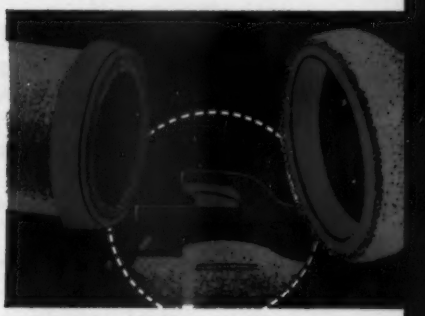
SMOOTHER—Nothing can adhere to the glossy, glass surface of Glas-Glaz. The design of the Amvit Joint assures that the pipe is self-centered for self-cleaning action.



ACID RESISTANT—The interior surface of Glas-Glaz is of impervious chemically resistant glass. It positively cannot be harmed by sewage, chemicals, or hot liquids, and is especially adaptable for industrial wastes and chemical lines.



STRONGER—Amvit Joint is pliable, permitting reasonable deflection without leakage. The resiliency of the Amvit Joint permits it to absorb shocks or vibrations that cause failures in a more rigid type of joints.



FOOLPROOF JOINT—Amvit Joint is a true mechanical joint made from plasticized resins of polyvinyl chloride. It is a compression type joint on the ball and socket principle. When the joint is made, the surfaces of both bell and spigot rings are in constant high compression.

Fed up with old-style mixing? You'll be amazed at the results when you toss out cumbersome, hard-to-maintain mixing equipment and replace it with a simple, efficient LIGHTNIN Mixer.

You can mix anything that flows, in any amount up to and including six million gallons at one time. There's no guesswork about it. MIXCO engineers have devised an exact method that tells how much horsepower and torque you need to get the results you want.

Then the right mixer is specified from an almost unlimited range of power-speed combinations, assembled from standard stock components.

Every LIGHTNIN Mixer is guaranteed **unconditionally** to do the job you expect it to do. Hundreds of them have been in continuous service 20 years and more.

If this sounds like a common-sense way to approach a fluid-mixing problem, call in your LIGHTNIN Mixer representative now. His name is in Thomas' Register. Or write us direct.

Turbine-type LIGHTNIN Mixer, one of a series available in standard sizes from 1 to 500 hp.

Send catalog information on:

- ☐ Portable mixers
- ☐ Top-entering mixers
- ☐ Side-entering mixers
- ☐ All types

Lightnin® Mixers™

MIXCO fluid mixing specialists

Check, clip, and mail with your name, title, company address to:

MIXING EQUIPMENT Co., Inc., 144-h Mt. Read Blvd., Rochester 3, N. Y.
In Canada: Greey Mixing Equipment, Ltd., 100 Miranda Ave., Toronto 19, Ont.

For more facts circle 550 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 56)

page, marred sheets and buildup of paint on the belts. The magnetic rolls, furnished by Eriez Manufacturing Company, convey the sheets without slippage and this has reduced the number of damaged and marred sheets substantially.

Wire Hooks Save Bench Space

IN PERFORMING connector and terminal work on cable harnesses ranging in length from five to ten feet, assemblers at Raytheon Manufacturing Company's North Dighton, Mass., plant were using up a lot

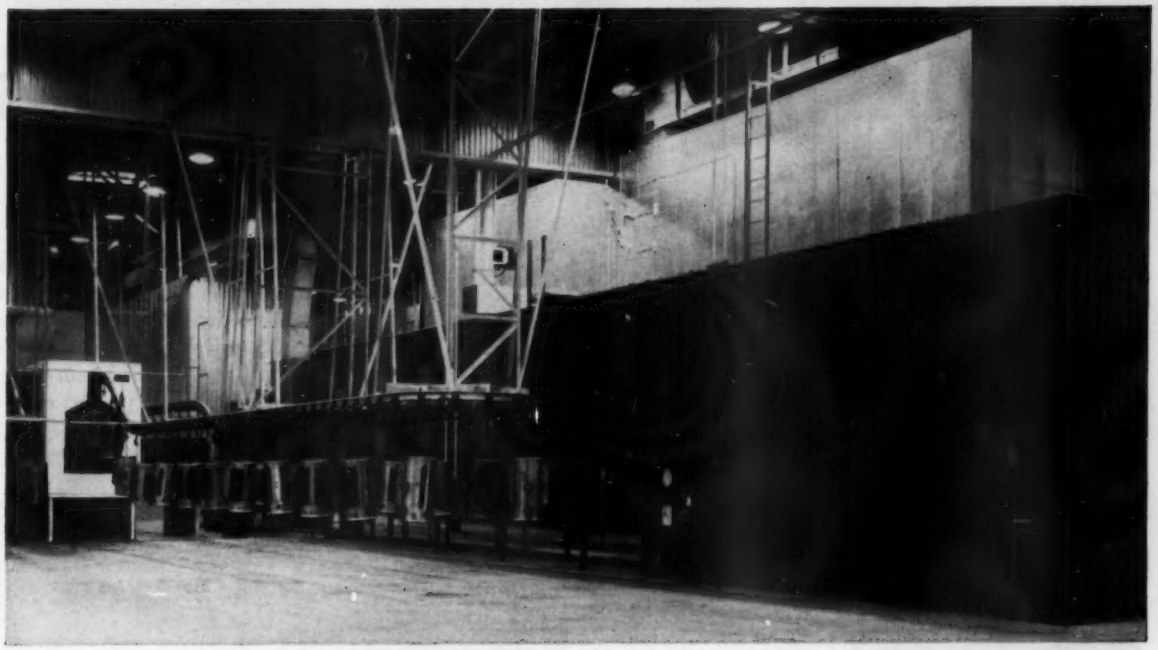
Cables are draped over hooks on pole to hold them in position for assembly.

of bench space which could profitably serve other purposes.

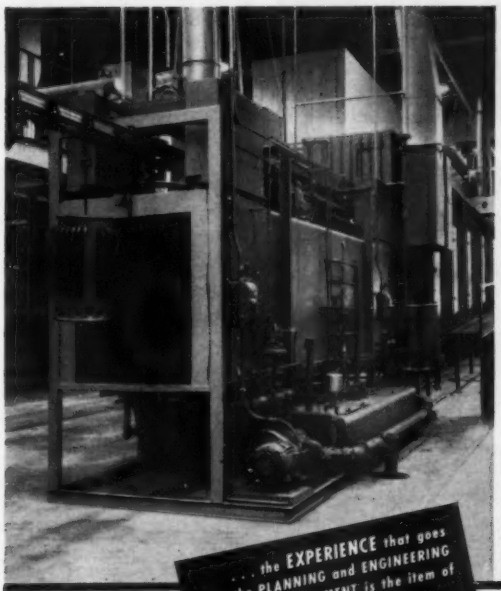
To reduce the amount of bench space needed for this operation, five-foot-high pole-type stands were mounted on the benches. U-shaped hooks are spaced at varying heights on the poles to hold harnesses of different lengths. Vinyl sleeving is slipped over the hooks to prevent chafing of the cable.

With this arrangement, about 40 lineal feet of bench space required when the cables were stretched out horizontally could be put to other uses. It was decided to bench mount the poles rather than suspend them from the ceiling or mount them on the floor. Benches may be rearranged without moving the poles.

FINISHING SYSTEMS . . .



Mahon Combined Flow Coating and Spray Painting Machines Paint Transformer Tanks Automatically at Westinghouse!



. . . the EXPERIENCE that goes into the PLANNING and ENGINEERING of MAHON EQUIPMENT is the item of GREATEST VALUE to YOU!

In a complete automatic Finishing System, recently installed by Mahon in the Westinghouse plant at Athens, Ga., transformer tanks with recessed bottoms are painted automatically, inside and outside, in an inverted position as they pass through specially designed, combined Flow Coating and Automatic Spray Painting Machines—tanks are rotated as they pass through the two simultaneous coating processes. Four coats of paint are applied and each is oven-baked on one continuous line that passes through Four Automatic Painting Machines—one is shown at left.

Other Mahon equipment in this Westinghouse plant includes a Transformer Coil Dehydrating Oven and a second Complete Mahon Finishing System for applying the final coat on completely assembled transformers.

If you are considering a new finishing system, or any unit of finishing or processing equipment, you will want to discuss methods, equipment requirements and possible production layouts with Mahon engineers . . . you'll find them better qualified to advise you, and better qualified to do the initial planning and engineering which plays such an important role in the ultimate operating efficiency of specially designed equipment of this type.

THE R. C. MAHON COMPANY • Detroit 34, Michigan

Sales-Engineering Offices in Detroit, New York, Chicago and Los Angeles

Engineers and Manufacturers of Complete Conveyorized Finishing Systems: Metal Parts Washers, Metal Cleaning and Rust Proofing Machines, Conveyorized Cleaning and Pickling Machines; Dry-Off Ovens, Spray Booths, Electrostatic Spray Enclosures, Flow Coaters, Dip Coaters, Finish Baking Ovens, and Paint Stripping Equipment; Core Ovens, Soldering Ovens, Dehydrating Ovens, Heat Treating and Quenching Equipment for Aluminum and Magnesium; Dust and Fume Control Installations, and Many Other Units of Special Plant and Production Processing Equipment.

See Sweet's Plant Engineering File for Information and Representative Installations, or Write for Catalogue A-659

MAHON

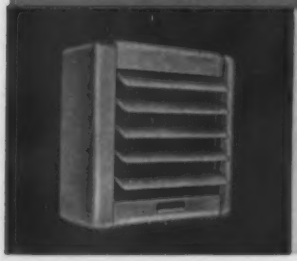
For more facts circle 551 on Reply Card

Speaking of FLEXIBILITY...

UNIVAC® computer confirms

*C*an you think of a need that calls for a unit heater — steam, hot water, gas, or electric — which can not be met by one of these Nesbitt units? If you do, let us know; we may add to our line. Meanwhile, with more than 40 years of proved excellence in *this* line, why not make Nesbitt your name to go buy?

STEAM & HOT WATER



1,084 ways to employ Nesbitt Propeller Fan Heaters

Eight basic sizes, 24 models; universal heating elements for steam or hot water; capacities, 15,200 to 335,000 Btu/hr; sound code rated—*Publication 401.*

6,510 ways to employ Nesbitt Cabinet Unit Heaters

Series A: versatile high-capacity units; seven basic sizes (265 to 1860 cfm) for steam (71 to 545 sq. ft. edr) or hot water (9.1 to 120 mbh); recessed, semi-recessed, or non-recessed models; floor, wall, ceiling and inverted mountings—*Publication 403.*

5,170 ways to employ Nesbitt Little Giant Heaters

Draw-through propeller fan units with universal heating elements for steam or hot water; 14 sizes, 34 models; 16,000 to 610,000 Btu/hr; wide choice of vertical or horizontal discharge outlets; sound code rated—*Publication 402.*

22,800 ways to employ Nesbitt Giant Unit Heaters

For large capacity heating and/or ventilating, free or static delivery; 12 basic sizes each with choice of 10 heating elements; steam or hot water; 83,000 to 1,735,000 Btu/hr; one to three fans; four mountings—*Publication 404.*

GAS-FIRED UNITS

200 ways to employ Nesbitt Propeller Fan Heaters

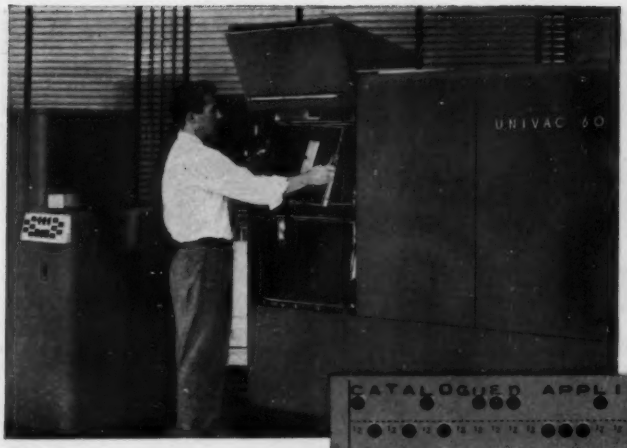
Lightweight and more compact, the new Series K gas-fired unit heater is versatile and attractive. 25,000 to 250,000 Btu/hr input. Sound code rated—*Publication 400.*

240 ways to employ Nesbitt Blower Fan Heaters

For extreme quietness, free delivery or use with ducts. Eight basic sizes, 50,000 to 250,000 Btu/hr input; universally approved for all types of gas; standard horizontal or (optional) double deflection louvers —*Publication 400-2.*

30 ways to employ Nesbitt Gas-fired Duct Furnaces

Efficient, automatic gas heating for use with air-conditioning units or with custom ductwork in heating and processing. Six basic sizes, 80,000 to 250,000 Btu/hr input; aluminized steel or stainless steel heat exchanger—*Publication 400-3.*



that there are

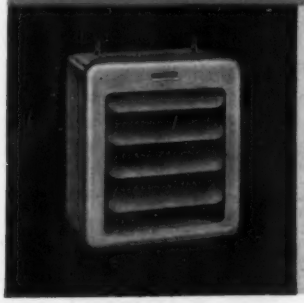
38,852 ways to employ the Nesbitt complete line of UNIT HEATERS

Fantastic? Not at all! Considering all the basic sizes, installation arrangements, types and capacities of heating elements, fan speeds, and discharge outlets, there are actually 38,852 catalogued situations in which at least one of the broad line of Nesbitt Unit Heaters will meet the demands with complete satisfaction. What more could you ask?

Made by* John J. Nesbitt, Inc., Philadelphia 36, Pa.—Basic Ingredient: *Excellence

ELECTRIC UNITS

Also available in electric: Nesbitt Syncretizer and Thermovent heating and ventilating units; Nesbitt Wind-o-line and Sill-line radiation.



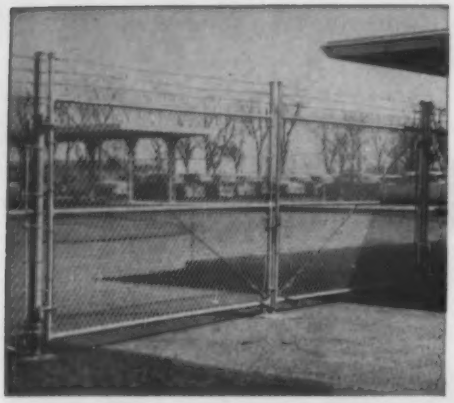
28 ways to employ Nesbitt Propeller Fan Heaters

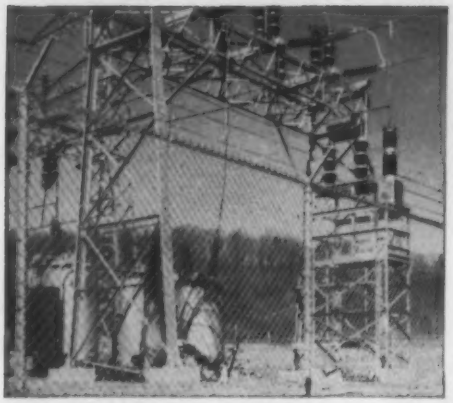
Fast and efficient heat, automatic or manual control; in four basic sizes, 14 models; capacities from 5,118 to 122,832 Btu; replaceable black-heat elements; totally enclosed motors; quiet Q-type fans—*Publication E401.*

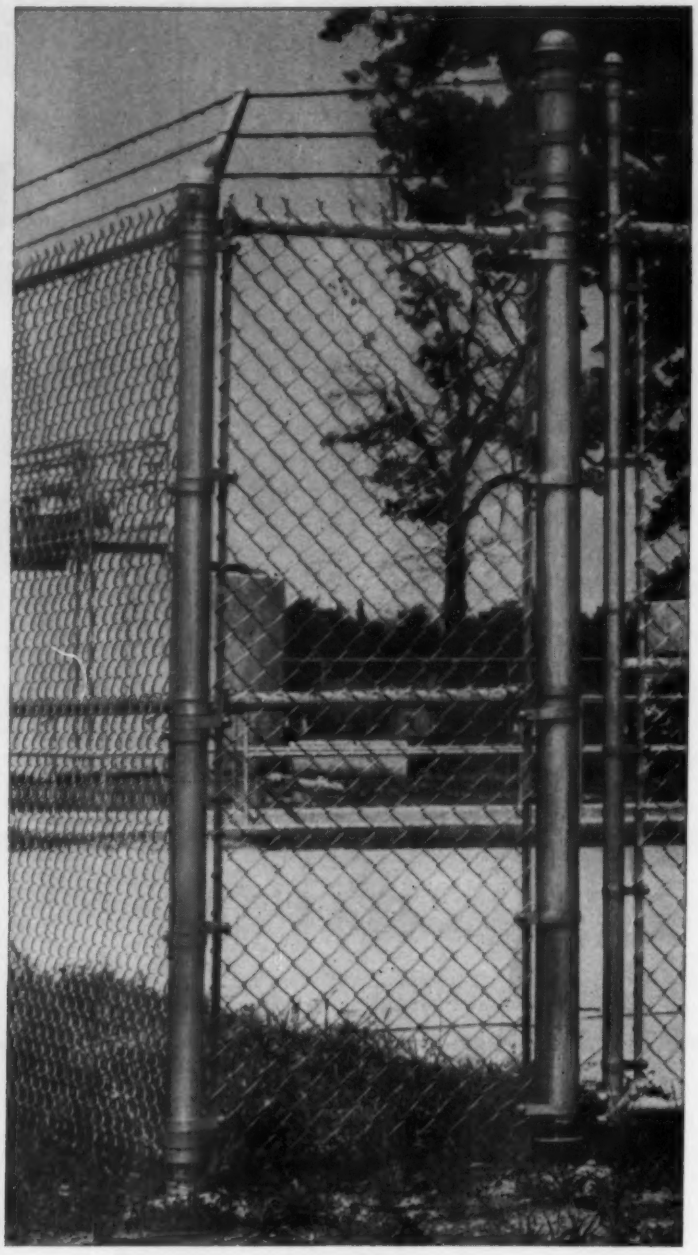
2,790 ways to employ Nesbitt Electric Cabinet Heaters

Three basic sizes, 10 models; 3.3 to 30 kw, 11.4 to 102.4 mbh; recessed, semi- and non-recessed models; floor, ceiling, wall, or inverted mounting; manual or automatic control; two or more fans; sound code rated—*Publication E403.*

For more facts circle 552 on Reply Card







with Aluminum THIS FENCE IS MAINTENANCE-FREE!

Chain Link Fencing of Alcoa Aluminum Needs No Protective Painting

Because aluminum supplies its own protection against highly corrosive industrial elements, applications throughout the years have proven advantages more than skin deep. Alcoa® Aluminum alloys age to a pleasing shade of gray and need no painting to preserve appearance or strength.

The superior combination of durability and appearance in chain link fencing of Alcoa Aluminum is evidenced in installations over 30 years old. Alcoa Aluminum consistently outlasts conventional installations . . . with an absence of maintenance cost.

Check these other advantages you get with Alcoa Aluminum:

High Strength—Average tensile strength of Alcoa's new alloy is 57,500 psi.

Easy Erection—Light weight means less labor.

Readily Available—Reliable manufacturers and erectors in 48 states. Contact your nearest Alcoa sales office.

For your copy of 12-page illustrated booklet and a summary of recently bid prices on 4-ft-high and 6-ft-high all-aluminum fencing, write to Aluminum Company of America, 2057-H Alcoa Building, Pittsburgh 19, Pa.

ALCOA ALUMINUM

Your Guide to the Best in Aluminum Value

For Exciting Drama Watch "Alcoa Theatre," Alternate Mondays, NBC-TV, and "Alcoa Presents," Every Tuesday, ABC-TV

For more facts circle 553 on Reply Card

For more facts circle 554 on Reply Card →

Painting by Ned Seidler

FACT

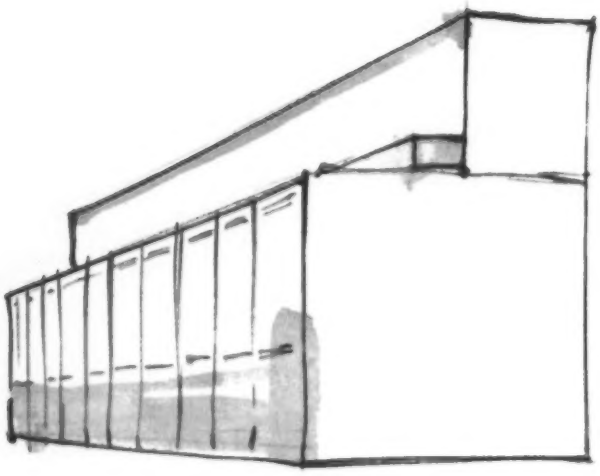
A dollar allocated for electrical equipment is worth more . . . when it is used to buy I-T-E equipment. Because I-T-E's policy is to build its equipment better, and yet charge no more.

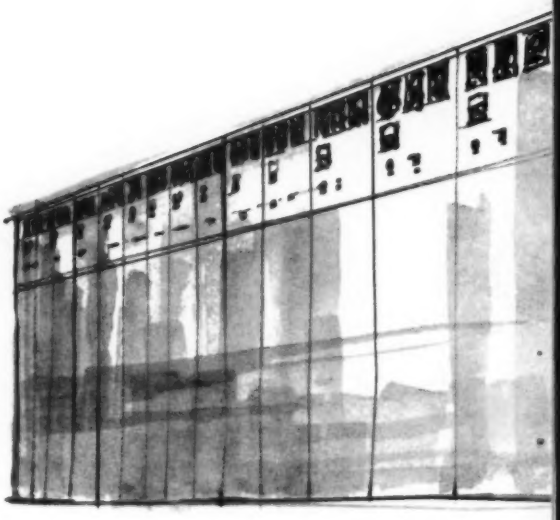
Take a typical secondary unit substation, for example. It features the new K-LINE circuit breakers . . . today's most advanced line. They stack four high in ratings up to 600 amp . . . save roughly ⅓ the space and half the weight formerly required. Circuit breaker pulldown handle with stored energy mechanism gives quick-make closure that means greater operator safety and longer contact life. The breaker can be drawn out to disconnect position without opening the door. And if the load increases later, expanded range trip devices adjust quickly and without added expense.

These features add up to real dollars and cents savings over the life of the equipment. Yet they cost nothing extra. In addition, I-T-E substations are engineered and manufactured in a single I-T-E plant for extra installation ease and better performance.

There are other I-T-E facts too. Turn page.

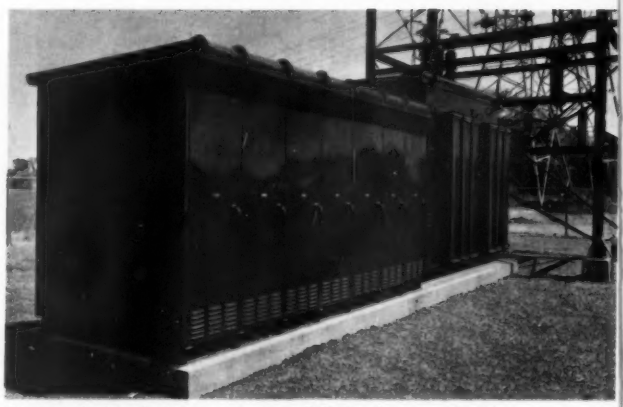
I-T-E CIRCUIT BREAKER COMPANY





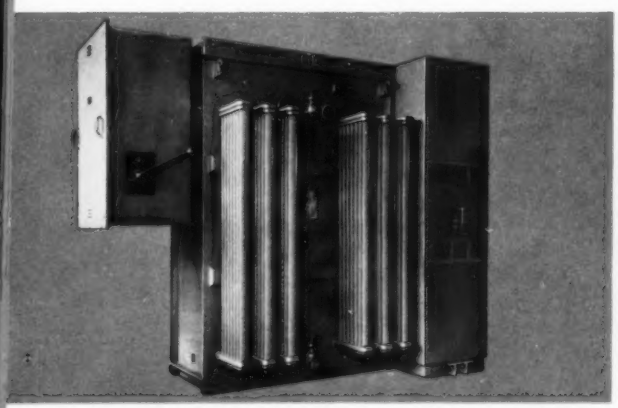
WHERE ELECTRICITY GOES I-T-E GOES

Are you fully acquainted with the broad I-T-E line . . . and the many ways it can help your dollars buy more?



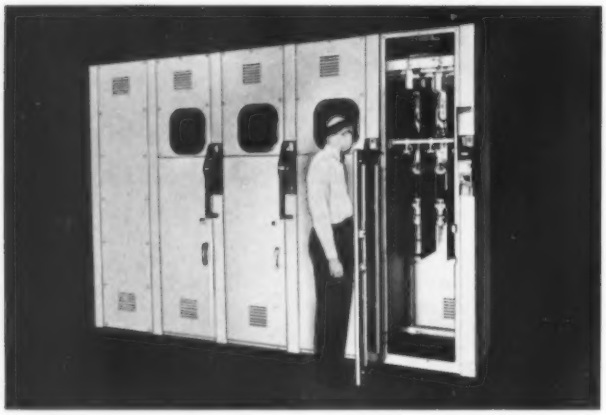
Custom designed at no extra cost. I-T-E primary unit substations are designed and built to meet the specified power, space and future expansion requirements of the particular installation for which they're ordered. In addition to standard outdoor metal-clad construction, weatherproof walk-in switchgear is also available. Transformer and switchgear sections are constructed in the same plant to assure smooth coordination of components, easier assembly, pretested performance, and on-time delivery.

Protection for primary power. I-T-E metal-clad switchgear has many extra advantages not available elsewhere. Take a good close look. You'll find extra sturdiness that means extra serviceability. And extra craftsmanship that gives the owner a feeling of pride. For easy inspection, even the rear doors are hinged, and components are completely accessible. All essential circuit breaker components are mounted on the breaker for easier access. Uniform flux density magnetic arc field means superior protection . . . especially against high current faults. For extra safety, breakers stop automatically in test position when they're rolled into the compartments. They can't be moved into or out of connected position unless they're open.

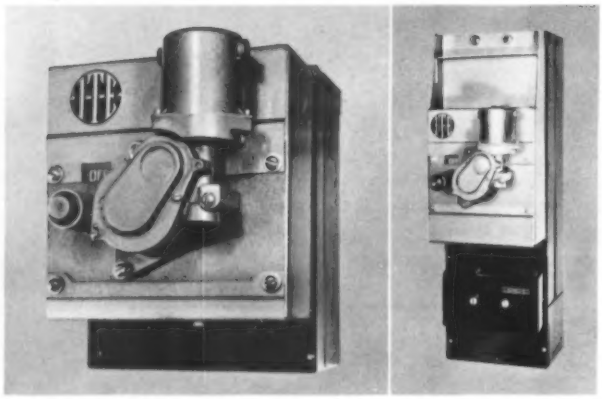


Self-contained substation. Saves installation cost. I-T-E TRANFO-UNIT combines primary disconnect, transformer and secondary circuit breakers all in one package. Nothing else to buy. Simplifies ordering. Delivered complete. Installation time and cost reduced to an absolute minimum. No complicated assembly of separate parts. Gives neat appearance. Completely safe. No live components open to contact by personnel. Needs no fence. Use for incoming power up to 3000 kva. Or spot near load areas in large plants.

600 volt value package. New URELITE® individually enclosed I-T-E K-LINE circuit breaker is ideal for single circuit protection and control, such as large motors and other heavy loads or for service entrance on many commercial-type buildings. Main disconnect contacts are visible through a side window for extra safety. Features quick-make closure, closed door disconnect, and expanded range trip device. Available in capacities from 15 to 1600 amp continuous, up to 75,000 amp interrupting.



Economical primary switching. I-T-E power switching centers save cost and time. Give dependable fused protection at low initial investment. Building block design speeds delivery. Preassembled units easy to install. Performance-proved I-T-E switches close safely into fault. Available for remote or automatic control. Up to 14.4 kv and 1200 amp.



Molded case economy . . . remote control luxury. Now I-T-E CORDON® circuit breakers are available with new TELEMAND* motor-operators for remote opening, closing or resetting. Gives pushbutton control from a distance. Permits automatic operation. CORDON circuit breakers provide up to 100,000 amp interrupting capacity in roughly half the switchboard space required by alternative devices. They cost approximately ⅓ less. TELEMAND is available for the complete range of molded case circuit breakers from 70 to 800 amp.

**Telemand is an I-T-E trademark*

I-T-E Circuit Breaker Company C-63A

1900 Hamilton St., Philadelphia 30, Pa.

- ☐ Secondary unit substations
- ☐ Metal-clad switchgear (4.16 and 13.8 kv)
- ☐ Primary unit substations
- ☐ URELITE circuit breakers
- ☐ Molded case circuit breakers
- ☐ Metal-enclosed bus
- ☐ Outdoor air switches
- ☐ TRANFO-UNITS
- ☐ Power switching centers
- ☐ TELEMAND (motor-operated molded circuit breakers)
- ☐ K-LINE LV switchgear (600 volt)
- ☐ Reclosers
- ☐ Distribution cutouts
- ☐ Other.....

Name.....Title.....

Company.....

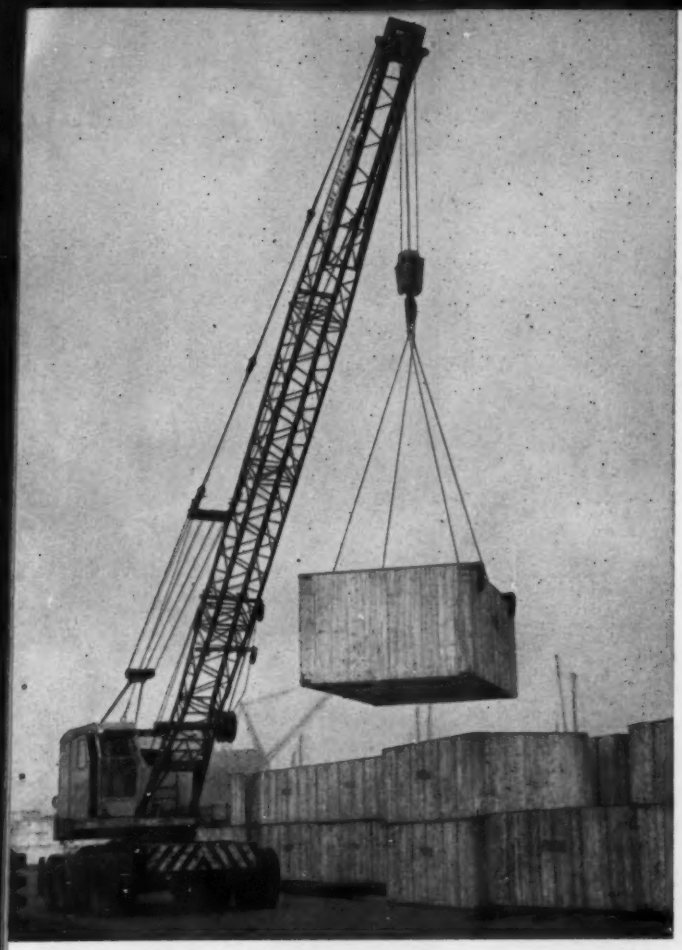
Street.....

City.....Zone.....State.....

SEND COUPON

Get complete, up-to-date information on I-T-E equipment.

I-T-E CIRCUIT BREAKER COMPANY



This 300 Series Self-propelled yard crane speeds up the unloading of crated autos for export at a Hoboken, N. J. pier.

MATERIAL MOUNTAINS MASTERED WITH AGILE AMERICANS

Crowded, busy yards or plants are a push-over for mobile Americans. Handling costs are shaved because seconds are saved, with the extremely maneuverable American Truck and Self-propelled Cranes. They provide *smoother lifting . . . precision spotting . . .* to help you get more work done in your efforts to keep materials moving.

Ideal for all kinds of yard duties, American 200 Series Truck Cranes are made specifically for tight budgets, tight quarters, tight schedules.

SMOOTHER LIFTING . . . PRECISION SPOTTING

- When you have two speed transmissions on American Truck and Self-propelled cranes you are assured accurate placing of loads without loss of horsepower.
- When the operator changes gears with the control lever, he automatically lowers his line speed, yet retains full horsepower without slipping clutches. This means a smoother swing . . . smoother, safer spotting of maximum loads . . . new control accuracy for steel erectors, bridge builders, shipyards, industrial plants . . . wherever loads need handling with infinite accuracy.
- Next time you see an American on the job, ask the operator . . . ask the owner . . . to show you how Americans are built to give you better service. Then contact your American distributor. He has complete detailed and illustrated catalogue information on American's entire line of crawler or truck crane models, capacities ½-yard, 12½ tons and up.

Serving industry for over 75 years

EXCAVATORS-CRANES to 2 yds.-60 tons
LOCOMOTIVE CRANES to 130 tons
DERRICKS-HOISTS to 800 tons
REVOLVER CRANES to 400 tons

AMERICAN HOIST
and Derrick Company
St. Paul 7, Minnesota

AMERICAN HOIST PACIFIC COMPANY
Special materials handling equipment

CROSBY-LAUGHLIN DIVISION
Drop forged fittings for wire rope-chain

For more facts circle 555 on Reply Card

Infra-Red
heating comfort
WITHOUT DUCTS, BLOWERS OR HEAT EXCHANGERS

WITH

Perfection **Infra-Red GAS Heaters** *Schwank*

Fired by Natural, LP or Manufactured Gas

"Our high ceilings presented a difficult heating problem. However, with your Infra-Red Heaters our heating situation is absolutely perfect and the savings on fuel is most gratifying", says R. C. Sheets, Vice President of the Solem Machine Co., Rockford, Illinois.

"What has pleased us so immensely is the perfectly controlled temperatures that are maintained day and night; even during sub-zero weather. Most of our workmen wear only light tee shirts!"

Add to this a 97% reduction in electric power consumption; no maintenance headaches because there are no moving parts; low annual fuel costs; and you will understand why over 15,000 users of Perfection Schwank Infra-Red Heaters are equally as enthusiastic. CALL, WRITE OR WIRE FOR COMPLETE INFORMATION AND LITERATURE.

MATCH THESE FACTS WITH *ANY* OTHER HEATING SYSTEM!

Building Size: 200′ x 250′ x 28′ with 50′ x 50′ high monitor running the 250′ length—a total of 1,735,500 cu. ft. (not including office)

Construction: Galvanized sheet metal wall and roof with 1½" aluminum vinyl-faced fiberglas insulation throughout. Three large overhead doors—three small walk-in doors

Mounting Heights: 82 units installed at 26′—28′—42′—48′

Temperatures: 70° during working hours—60° nights & weekends

Degree Days: 5118

Installed BTU: 3,888,000

Fuel Consumption (Infra-Red): 43,969 gal. Propane at 10¢ (a total of $4,396.80 for the period studied)

Electrical Cost (estimated for Infra-Red): $14.00

Estimated Heat Loss (computed on ASHRAE basis): 3,640,000 BTU per hr.

Average Inside Temperature: 63.5° F

Degree Days For Period (base of 58.5): 4378

Probable Fuel Consumption (ASHRAE—efficiency of 80%): 5,975,000,000 BTU

Actual Fuel Consumption (Infra-Red): 4,020,000,000 BTU

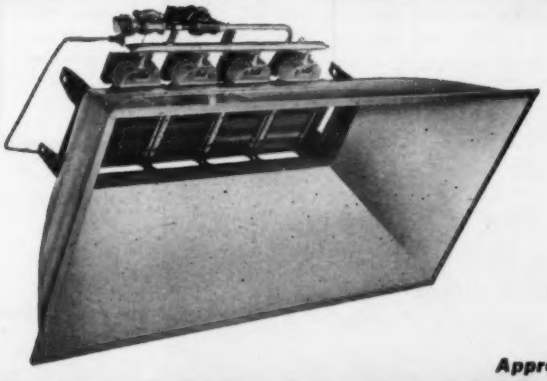
Period of Study: November 19, 1958 to March 13, 1959

Perfection industries 1135 Ivanhoe Rd., Cleveland 10, Ohio

division of Hupp Corporation / licensee of American Infra-Red Radiant Co.

Under Schwank U. S. Patents 2775294 and 2870830 and pending applications

For more facts circle 556 on Reply Card



WARM THE MAN AND THE JOB ***. . . NOT*** THE AIR

The rays of heat energy from these generators, like the rays of the sun, heat only the objects they touch and are not wasted on the air around the objects. Once the energy waves strike a person in their path, or the floor, wall or machinery, they are transformed into heat. The result is uniform heating comfort no matter how fast temperatures change.

Approved by American Gas Association, Underwriters, C.G.A. and C.S.A

The Temperature Control Designed for Fast

"DO IT YOURSELF" MAINTENANCE

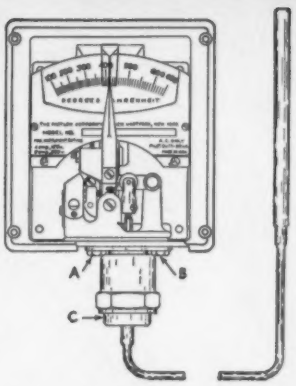
Right on the Job!

Rugged simplicity of design—along with the direct, positive power of mercury-actuation — combine to give Partlow maintenance and performance advantages no other type of temperature control can hope to equal.

Simplicity in the Partlow, for one thing, means that the control element can be changed *at the job site* in a matter of minutes with no other tool than a screwdriver . . . "Down time" is cut to an absolute minimum!

And simplicity in the Partlow also means the complete elimination of fussy electronic gadgets, delicate levers, hairsprings and other accessories that have a tendency to break down at the first trace of jar or jostle. Partlow controls are famous for their unfailingly accurate performance even under the most adverse operating conditions.

If you use or manufacture process equipment within the –30° to 1100° F. range, there's a Partlow pneumatic, electric or self-contained gas control (recording, indicating or non-indicating), to fit your application *precisely*. For details, write The Partlow Corp., New Hartford, New York. Dept. PE-859.



Diagrammatic view of the new MFS reveals "quick-change" feature common to all Partlow controls. In case of damage, merely unscrew at points (A) and (B), and remove element (C) from case. Reverse this process, and your Partlow is ready to resume operation.

You can pay more but you can't buy better than

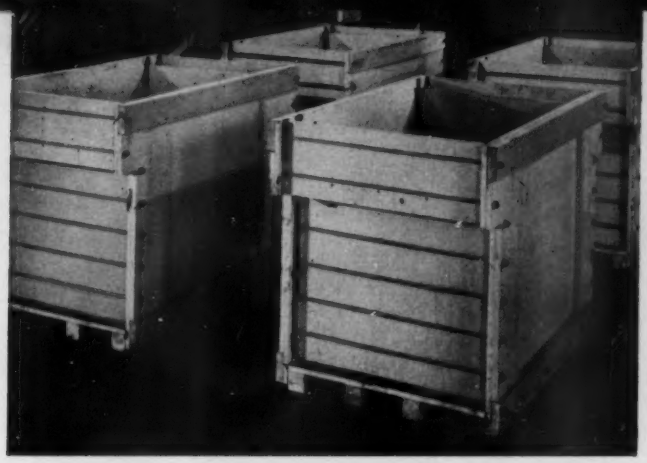
PARTLOW

TEMPERATURE CONTROLS

Export Ad. Aurlema, Inc.,
85 Broad St., New York 4, N. Y.

For more facts circle 557 on Reply Card

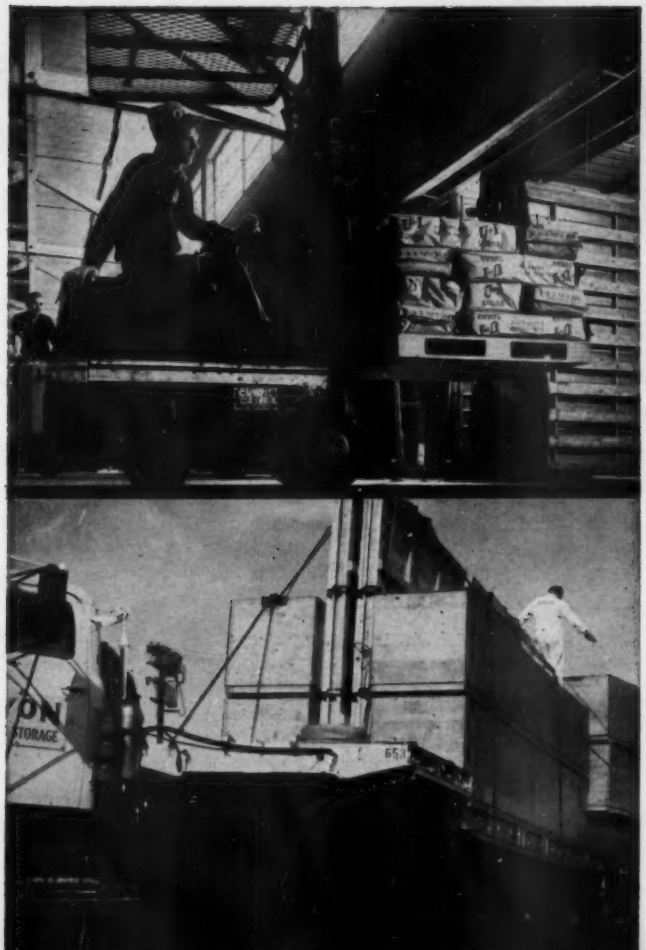
For more facts circle 558 on Reply Card →



TANKS of GPX are easily constructed, do not leak or corrode. Resistant to hydrocarbon, salt, soap, hydrochloric and sulphuric solutions, organic solvents, many others.

GPX® plastic-faced plywood solves your special problems!

Armor-hard high density plastic overlay is fused to high-grade exterior plywood. Tough *GEORGIA—PACIFIC* **GPX** resists abrasion, chemicals, extreme temperatures, surface checking.



PALLETS, bins, chutes wear longer when made of GPX! Up to 30 times the abrasion resistance of unprotected plywood!

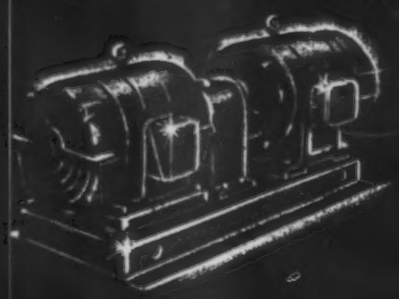
RE-USABLE CRATES of GPX for critical storage or handling. The smooth, tough, plastic face protects against moisture, extreme temperatures, corrosives and contamination. Dimensionally stable. Requires no painting.

Standard thicknesses and panel sizes. Special sizes on order. Call your local G-P source or write for sample and specifications to Georgia-Pacific, Dept. PE 859, Equitable Bldg., Portland, Ore.

GEORGIA—PACIFIC

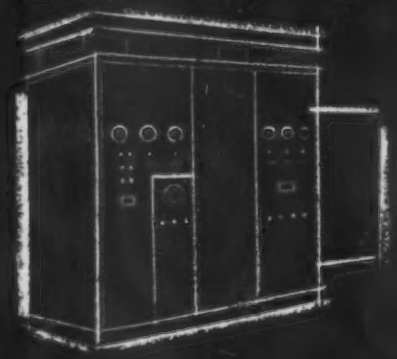
Plywood & Redwood
Lumber & Hardboard
Pulp & Paper

1 Precise high-frequency drives for generators or converters



Because of its exact speed characteristic, the Syncro-Spede is an ideal driver for high-frequency generator sets where precise frequency is a necessity. The elimination of slip provides exact frequency throughout the entire load range of the motor.

2 Precise timing, metering, and recording devices



Syncro-Spede delivers and maintains exact synchronous speed within rated capacity regardless of load or line voltage dips. Its design permits mechanical modifications to meet special needs. Since it eliminates error caused by speed fluctuations, this new Louis Allis motor is also ideal for memory drums and precision timing devices.

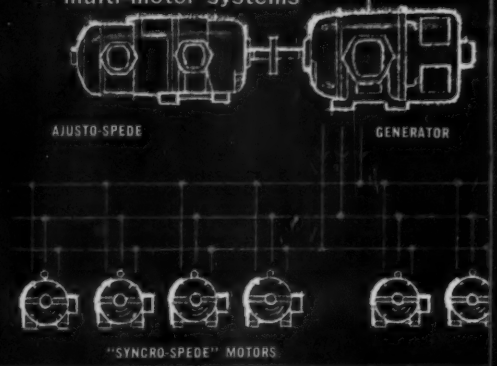
3 Constant single- or multi-speed conveyor drives

Syncro-Spede gearmotors can provide exact constant conveyor speed — or maintain correct relation of several conveyors operating at different speeds. Used with Louis Allis gear drives, the Syncro-Spede offers a practical, low-cost solution to low-speed conveyor drive requirements —down to 7.5 rpm.

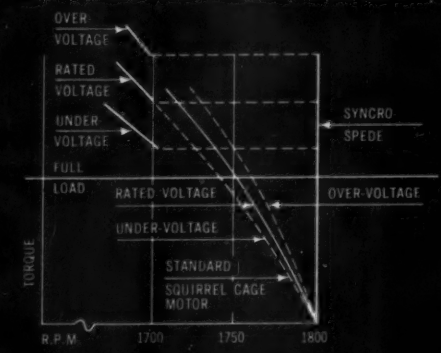
Below values are typical values based upon 100% pull-in torque with the external inertia equal to no more than twice the rotor inertia. To obtain full load and locked amps for other standard low voltages, multiply below 220 volt values by the inverse ratio of the voltages. For applications with high external inertias, refer to factory with specific inertia values.

HP	Synch. RPM	Frame Size	Full Load Amps 220 V.	% Locked Rotor Torque	Locked Amps 220 V.	Full Load Power Factor	Full Load Efficiency	Rotor WK²
1	1800 1200	182 184	4.4 4.6	275 200	30 30	59 58	76 75	.18 .22
1.5	1800 1200	184 184	6.6 7.0	265 200	41 41	59 58	76 75	.18 .24
2	1800 1200	184 213	7.7 8.3	250 200	58 58	64 62	82 78	.22 .49
3	1800 1200	213 215	11 14	250 200	83 83	67 61	82 78	.49 .80
5	1800 1200	215 254U	17 21	200 175	120 120	68 61	85 82	.80 1.30
7.5	1800 1200	254U 256U	25 28	200 175	170 170	68 62	86 83	1.30 1.80
10	1800 1200	256U 284U	34 36	200 175	240 240	68 63	85 83	1.80 3.50
15	1800 1200	284U 326U	49 54	200 165	330 330	70 63	86 84	3.0 5.50
20	1800 1200	286U 326U	63 65	200 150	420 420	70 64	87 85	5.00 5.50
25	1800	324U	79	200	520	70	87	6.0
30	1800	326U	95	200	700	70	88	7.0

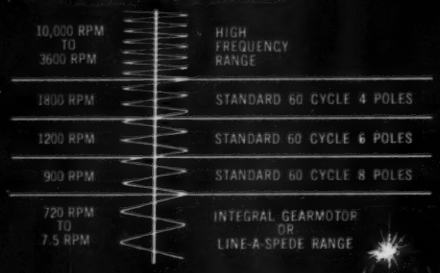
4 Adjustable frequency multi-motor systems



5 Any constant speed requirement



6 High speed — high frequency operation

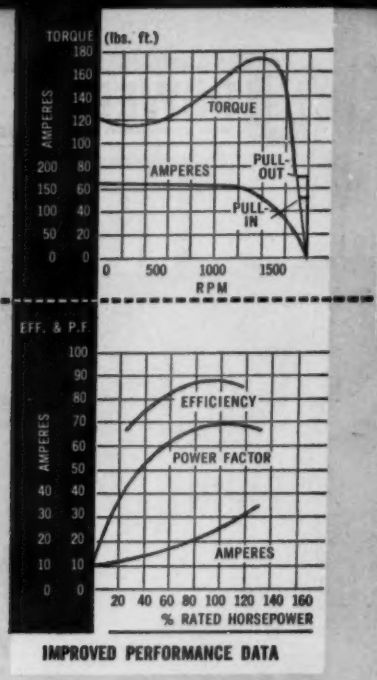


Syncro-Spede motors of different ratings and output speeds can be synchronized from a single adjustable frequency source — motors of various speeds will hold their exact relationship within an operating frequency range of 5 to 1,000 cycles. This combination provides precise adjustable frequency power for many applications in the printing, paper, plastic, and textile industries.

The Syncro-Spede offers virtually unlimited usage. It is much smaller than equivalent reluctance and DC excited synchronous motors—outperforms both and costs less. Under full load conditions, a standard squirrel cage induction motor may vary between 1740 and 1760 rpm with a 10% voltage variation — the Syncro-Spede maintains exact synchronous speed.

Syncro-Spede's indestructible cast aluminum rotor is designed for high-speed — high frequency operation. The small diameter rotor enables the motor to attain speeds previously impossible with other types of synchronous motors. With special rotor designs, the Syncro-Spede can reach speeds of 10,000 rpm and higher.

New-product news from Louis Allis



IMPROVED PERFORMANCE DATA

The Louis Allis Syncro-Spede

...a synchronous motor built in the same NEMA frames as standard motors of equal horsepower!

It's compact, simple, versatile...and trouble-free!

The remarkable Louis Allis Syncro-Spede® Motor enables you to provide exact synchronous speed for *any* application for less cost — with fewer controls — and in less space than previously possible.

If your equipment or operation calls for precise constant speed, check the advantages this new motor offers you:

Space-saving design — The revolutionary Syncro-Spede needs no external excitation, wound rotating fields, collector rings or brushes. It's built in the same standard NEMA frames as ordinary induction motors of equal horsepower. It requires less space — is virtually maintenance-free.

Wide range of enclosures — The Syncro-Spede can be provided in a wide variety of enclosures to meet special operating requirements. For example, Syncro-Spede is readily available in totally-enclosed fan-cooled and explosion proof enclosures — thus permitting installations which were difficult to make with D.C. excited synchronous motors.

Unmatched versatility — Syncro-Spede is available in standard sizes up to 100 hp, and even larger ratings for special applications. It can also be furnished in a wide range of mechanical modifications . . . base- or flange-mounted—as a gearmotor or brakemotor — even as a rolled-shell shaftless motor for "built-in" applications.

For full particulars and expert application engineering help, contact your local Louis Allis District Office. Or write for Bulletin No. 1900 to The Louis Allis Co., 434 East Stewart Street, Milwaukee 1, Wisconsin.

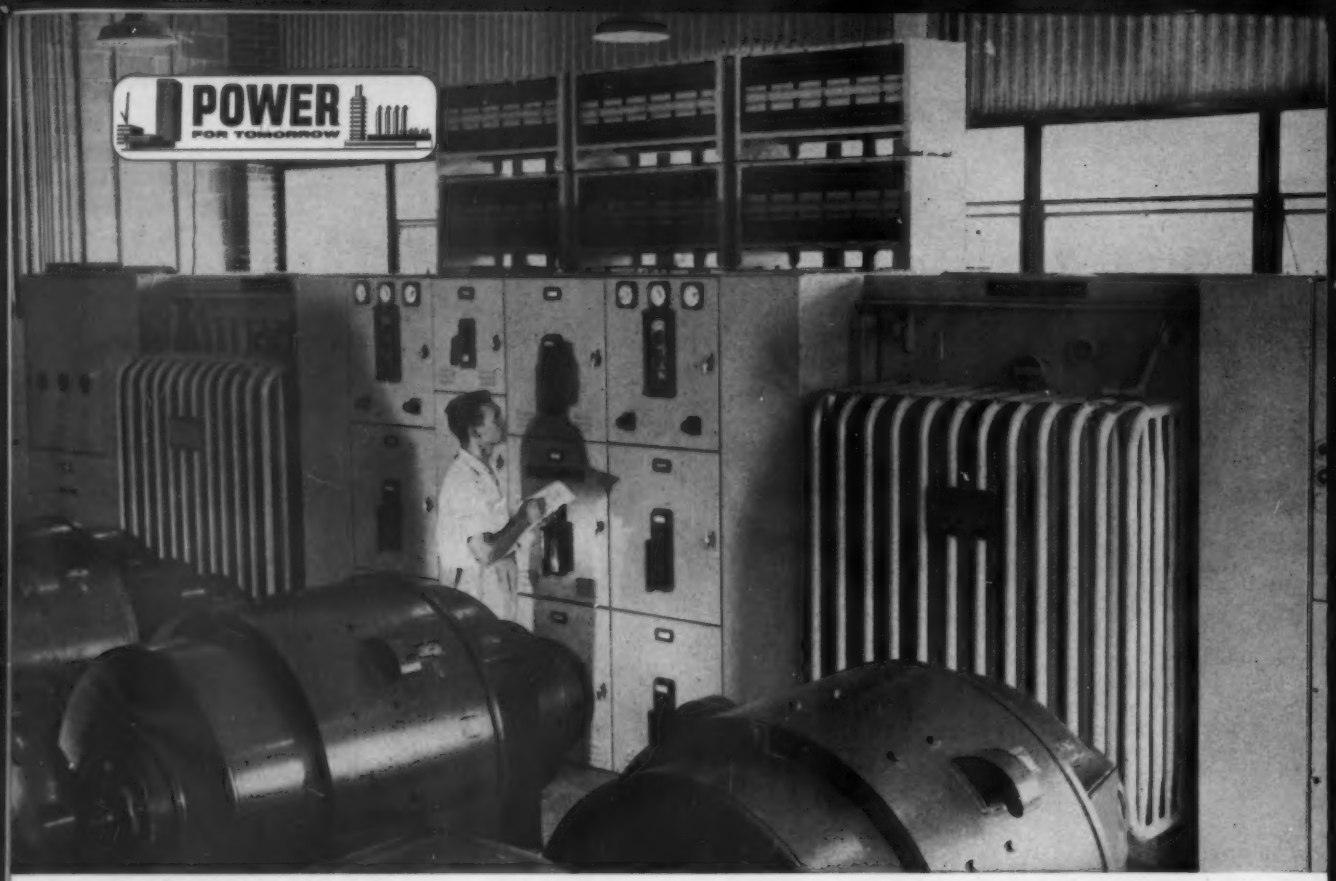
Syncro-Spede is a Trademark of The Louis Allis Company

MANUFACTURER OF ELECTRIC MOTORS AND ADJUSTABLE SPEED DRIVES

LOUIS ALLIS

LA-340

For more facts circle 559 on Reply Card



BUILDING BLOCKS OF POWER, load center unit substations, can be added easily to existing system to handle new load. This keeps capital investment at a minimum. G-E shunt capacitors in racks improve power factor, save on power costs.

SAVINGS UP TO $30/KVA!

Boost plant power NOW with General Electric 480Y/277-volt equipment. It pays off in reliable, quality power.

Converting to a reliable G-E 480Y/277-volt distribution load center system represents a profitable alternative to continued patching of an old installation, and can be carried out on a step-by-step basis over a period of time. Here are good reasons why:

RELIABLE SYSTEM performance depends on component reliability and built-in product features. General Electric unit substations incorporate standardized components manufactured under rigid quality-controlled conditions. Yet G.E. offers you a wide choice of units with capacities and ratings virtually custom-engineered to satisfy your requirements. These units, and other system components like metalclad switchgear, plug-in busway and transformers are designed for easy installation, or relocation to handle load density shifts.

QUALITY POWER is essential for efficient production, longer equipment life and power bill economies. One way that General Electric 480Y/277-v systems help accomplish this is by using shunt capacitors to improve power factor. Service-proven G-E Pyranol® liquid-filled capacitors—located close to loads—reduce system losses and increase system capacity as much as 20% or more.

FIRST-COST DOLLAR SAVINGS are realized with General Electric high-voltage power distribution systems because fewer, smaller conductors and circuit breaker components are needed. Savings increase substantially . . . up to $30 per kva . . . where feeder lengths exceed 200 feet. You also cut engineering and installation costs. G-E primary switchgear and unit substations are factory-assembled in large sections for easy handling and fast installation. Outstanding product features, coupled with General Electric's system-engineering services, simplify purchasing problems and protect your system investment.

WRITE FOR FREE BULLETIN on General Electric 480Y/277-v power distribution equipment, or contact your local G-E Apparatus Sales Office for more information. General Electric Co., Sect. 680-17, Schenectady 5, N. Y.

GENERAL ELECTRIC

For more facts circle 560 on Reply Card

Prepared by B. A. Wasil, Structural Engineer

DESIGN OF CONCRETE FOOTINGS PART II

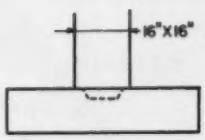
IN THE LAST Brief, the simple non-reinforced wall footing and the square column footing were discussed. The square footing is the most efficient footing to use for the individual axially-loaded column. However, where there is interference with other footings, machine pads, underground utilities, property lines, etc., where one dimension is limited, the rectangular footing becomes necessary.

The example that follows has the same data as that for the square column footing in the last Brief, except that there is a limitation in one dimension.

Design of a Rectangular Column Footing

Governing Data

Column Load: 245 kips (This includes weight of column, but not weight of footing.)
Bearing Value: f_b=3 kips/sq ft
One dimension limited to 7 ft



Allowable stresses	*Design Constants*
f_s=20,000 psi	k=0.403
f'_c= 3,000 psi	j=0.866
f_c= 1,350 psi	R=236
v_c= 75 psi	n= 10
u = 240 psi	

Design

1. Size of footing

Assume total depth of footing is 24 in. Then, as shown in the last Brief, the net bearing pressure is 2700 lb/sq ft.

$$\text{Footing area} = \frac{245{,}000}{2700} = 90.8 \text{ sq ft}$$

Sides of footing, s=7 ft x 13 ft=91.0 sq ft

2. Shear and depth for shear

Because the total area of the footing remains approximately the same as for the square footing, depth for shear remains unchanged. As in the previous problem, d=17 in.

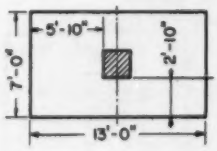
3. Moment and check of depth for moment

$$M = \frac{2700 \times 7.0 \times 5.83^2}{2} = 321{,}000 \text{ ft-lb}$$

$$bd^2 = \frac{M}{R}$$

$$12 \times 7.0\ d^2 = 194.3$$

d=13.9 in. <17 in., OK



4. Steel Requirements

There will be two computations for steel:
a. Steel running in long direction;
b. Steel running in short direction.

The code also requires that a proportion of the steel required in the short direction equal to $\frac{2}{s+1}$ should be centered in a bond of width equal to the short side; s being the ratio between the long side and the short side of the footing.

a. Steel running in the long direction

$$A_s = \frac{M}{f_s jd} = \frac{321{,}000 \times 12 \times .85}{20{,}000 \times .866 \times 17} = 11.12 \text{ sq in.}$$

Once again, the 85 per cent reduction is permitted.

b. Steel running in the short direction

$$M = \frac{2700 \times 13.0 \times 2.83^2}{2} = 140{,}600 \text{ ft-lb}$$

$$A_s = \frac{140{,}600 \times 12 \times .85}{20{,}000 \times .866 \times 17} = 4.87 \text{ sq in.}$$

5. Bond Requirements

a. Steel running in long direction

V=2700 x 7.0 x 5.83=110,200 lb

$$\Sigma_o = \frac{V}{ujd} = \frac{110{,}200 \times .85}{240 \times .866 \times 17} = 26.5 \text{ in.}$$

Use nine No. 10 bars for long direction:
A_s=11.43 sq in.
Σ_o=35.9 in.

b. Steel running in short direction

V=2700 x 13 x 2.83=99,300 lb

$$\Sigma_o = \frac{99{,}300 \times .85}{240 \times .866 \times 17} = 23.9 \text{ in.}$$

Use nine No. 7 bars for short direction:
A_s=5.40 sq in.
Σ_o=24.7 in.

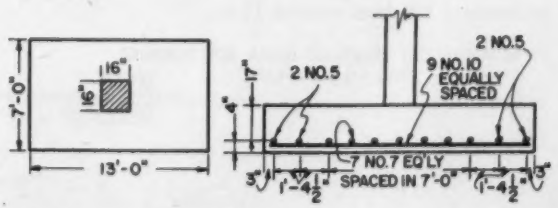
$$s = \frac{13}{7} = 1.86$$

Therefore,

$$\frac{2}{s+1} = \frac{2}{1.86+1} = 0.70$$

The number of bars required in a centered band equal to 7 ft is 0.7 x 9=6.3; say 7 bars. In attempting to keep to a maximum spacing of 18 in. in the slab, the following sketch is developed. Note the difference in spacing between the seven bars in the center, to fit them into the width equal to the short side.

6. Sketch



Non-axially loaded footings

An important footing consideration that often arises is the individual column footing that must resist a moment in addition to an axial load. In the simplest situation, the moment occurs only on one of the axes of the column and footing.

Two cases of this problem will be illustrated:

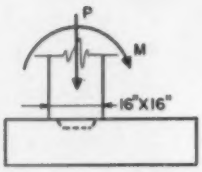
1. the moment acts in one direction only;
2. the moment may act clockwise or counterclockwise but its maximum value does not exceed a given amount.

Case 1. The most efficient way of handling this situation is to provide a square or rectangular footing eccentrically placed under the column, such that the back pressure of the soil becomes uniform.

Design of a Square Column Footing (subject to an axial load and a moment fixed in direction)

Governing Data

P=245 kips
M=204 ft-kips
Bearing value f_b=3 kips/sq ft



Allowable stresses		*Design Constants*	
f_s	=20,000 psi	k	= 0.403
f'_c	= 3,000 psi	j	= 0.866
f_c	= 1,350 psi	R	=236
v_c	= 75 psi	n	= 10
u	= 240 psi		

Design

1. Size of footing

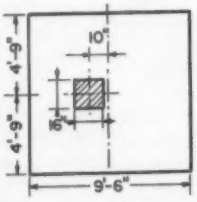
Assume total depth is 24 in. and once again the net bearing pressure=2700 lb/sq ft

$$\text{Footing area} = \frac{245{,}000}{2700} = 90.8 \text{ sq ft}$$

Side of footing, s=9.52 ft
Use 9 ft, 6 in. by 9 ft, 6 in.

The footing is placed off-center from the column such that the resultant of the axial load and the moment lies at the center of the footing—thus providing a uniform soil pressure of 2700 lb/sq ft. The center of the footing is therefore:

$\frac{204}{245} \times 12 = 10$ in. from the center of the column, in one direction.



2. Shear and depth for shear

Since we are dealing with the same area as the previous problems, d for shear remains 17 in.

3. Moment and check of depth for moment

$$\text{Max. } M = \frac{2700 \times 9.5 \times 4.92^2}{2} = 310{,}000 \text{ ft-lb}$$

$$bd^2 = \frac{M}{R}$$

$$(12 \times 9.5)d^2 = \frac{310{,}000 \times 12}{236}$$

$$d = 11.77 \text{ in.} < 17 \text{ in., OK}$$

4. Steel Requirements

In the lateral direction A_s=7.4 sq in., as shown in the last Brief.

In the longitudinal direction;

$$A_s = \frac{310{,}000 \times 12 \times .85}{20{,}000 \times .866 \times 17} = 10.8 \text{ sq in.}$$

5. Bond Requirements

In the lateral direction, again Σ_o=25.2 in.

In the longitudinal direction,

V=2700 x 9.5 x 4.92=126,300 lb

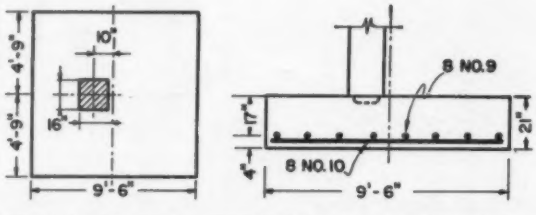
Taking the 85 per cent reduction of the moment for two-way footings;

$$\Sigma_o = \frac{126{,}300 \times .85}{240 \times .866 \times 17} = 30.4 \text{ in.}$$

Use eight No. 9 bars in lateral direction:
A_s=8.00 sq in.
Σ_o=28.4 sq in.

Use eight No. 10 bars in longitudinal direction.
A_s=10.16 sq in.
Σ_o=31.9 sq in.

6. Sketch



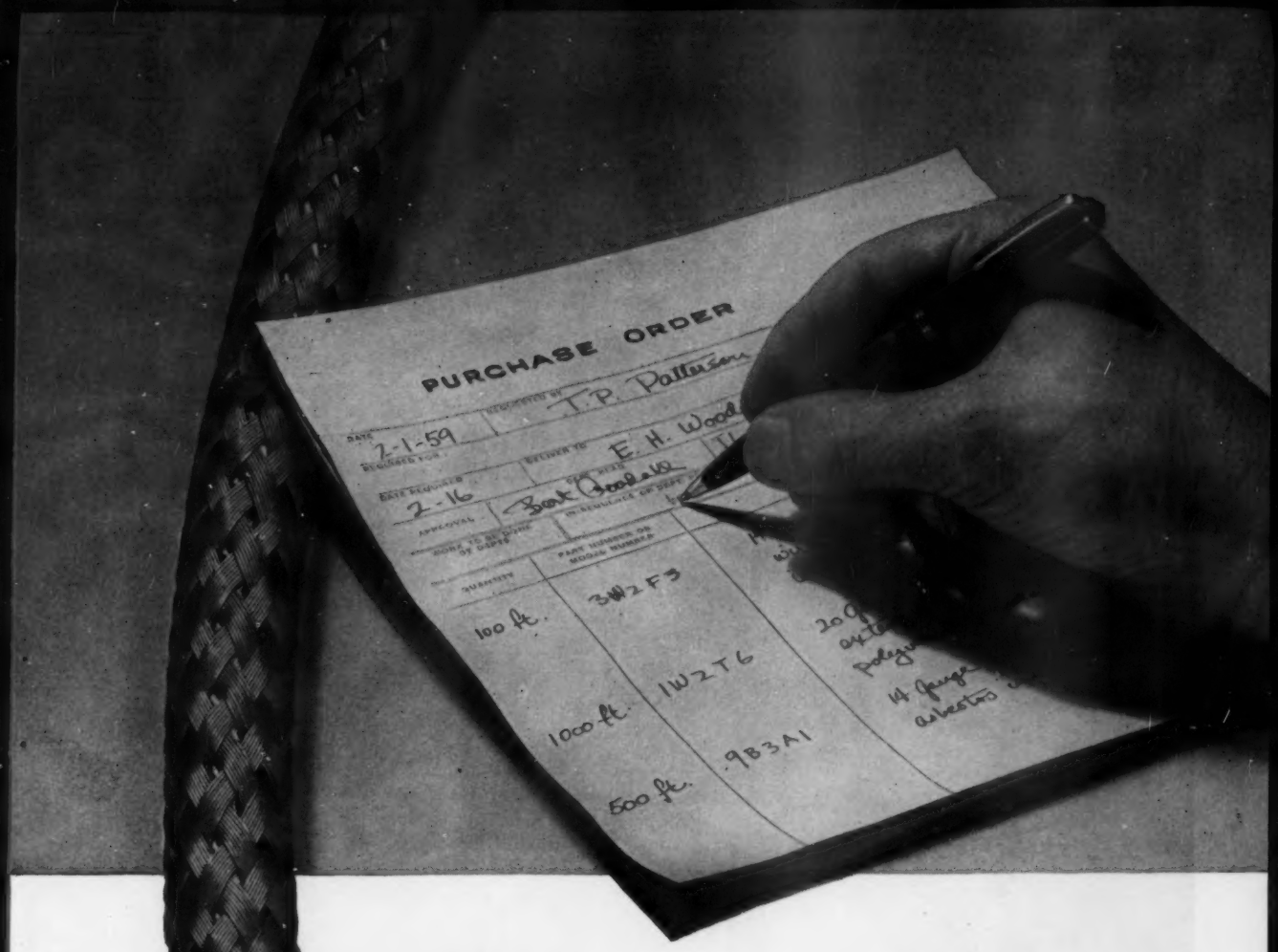
Case 2, together with problems in pile foundations, machinery pads and retaining walls will be illustrated in subsequent Briefs.

About the Author

B. A. WASIL, who has been preparing the Construction Briefs for the past three years, received his BS degree in civil engineering from New York University in 1942. He subsequently held positions with TVA; Parsons, Brinkerhoff, Hall and MacDonald; H. K. Ferguson Co.; and The Anaconda Copper Co.

In 1949, after obtaining his MS degree, he joined the civil engineering staff at the Illinois Institute of Technology. During these past 10 years of his teaching career, he has been associated with the consulting firms of DeLeuw-Cather, Paul Rogers and Assoc., and with the Bechtel Corp. and the Boeing Airplane Co.

He is now an Associate Professor in the civil engineering department of Syracuse University, Syracuse, N. Y.



Write your own ticket for Honeywell thermocouple wire

Choose from over 100 variations of insulated thermocouple wire and thermocouple extension wire. Honeywell can supply it from stock, with insulation in any of the conventional combinations of asbestos, glass, polyvinyl, Teflon and others. Should your application require other than conventional insulation, Honeywell can custom-make what you need, quickly and economically.

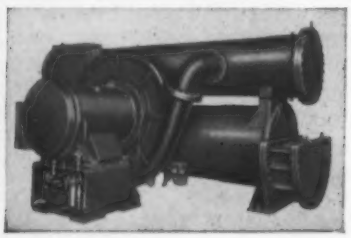
Call your local Honeywell field engineer . . . he's as near as your phone. Or write for Buyer's Guide C100-8.

MINNEAPOLIS-HONEYWELL, Wayne and Windrim Avenues, Philadelphia 44, Pa.

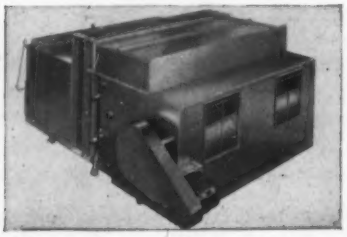
Honeywell

First in Control

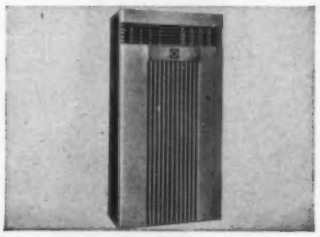
Centrifugal refrigerating machines for central-station air-conditioning systems.



Central-station air-conditioning units for industrial and office buildings.



Packaged commercial air conditioners, air- or water-cooled types, 3 to 20 tons.



One call for all

AIR-CONDITIONING EQUIPMENT: Refrigerating Machines • Water Chillers • Heating and Cooling Coils • Central-Station Air Conditioners Packaged Air Conditioners • Air Washers • **AIR-HANDLING EQUIPMENT:** Centrifugal, Propeller, and Axial Fans • Power Roof Ventilators Utility Sets • Specialized Fans and Blowers • **HEATING EQUIPMENT:** Firebox, Scotch-Type and Packaged Boilers • Steam, Hot-Water, and Gas-Fired Unit Heaters • Heating and Ventilating Units • Cabinet Heaters • **PROCESS EQUIPMENT:** Dust Collectors • Heat Exchangers Lube Oil and Jacket Water Coolers • Gyrol® Fluid Drives • Centrifugal Compressors • Mechanical Draft Fans • Surface Condensers

SOURCE...

can give you answers to all your air-conditioning problems

Whether you're installing a large central or "zone" system, or a system for a smaller plant—for the facts, the experience and the products to help you reach the right solution to your air-conditioning problems, call in American-Standard* Industrial Division.

You see, American-Standard Industrial Division supplies the major components that go into air conditioning – heating, cooling, air moving, cleaning, and moisture control—to give you one-source responsibility for quality and performance in equipment that is designed, engineered, and manufactured to work together.

There are offices in all principal cities, staffed by product specialists to assist with equipment selection and on-the-job problems. Call today. AMERICAN-STANDARD INDUSTRIAL DIVISION, DETROIT 32, MICHIGAN. IN CANADA: AMERICAN-STANDARD PRODUCTS (CANADA) LIMITED, TORONTO, ONTARIO.

* American-Standard and Standard® are trademarks of American Radiator & Standard Sanitary Corporation.

AMERICAN-Standard

INDUSTRIAL DIVISION

AMERICAN BLOWER PRODUCTS • ROSS PRODUCTS • KEWANEE PRODUCTS

For more facts circle 562 on Reply Card

IN STOCK NOW! THE NEW "M" FRAME BREAKER THAT BROKE THE 800 amp SIZE BARRIER!

Federal Pacific takes a big stride forward with the industry's smallest 800 amp breaker! Now one breaker replaces ordinary "K" breakers . . . replaces "KL" breakers . . . replaces "LM" breakers. No deeper, no taller, no wider than conventional 225 amp "K" frame breakers, the new "M" meets all application requirements from 125 through 800 amps . . . reduces inventory investment by ⅓ . . . occupies less space in switchboards and control centers . . . permits use of smaller individual enclosures and panelboards. Write for detailed bulletin #1416, Federal Pacific Electric Company, General Offices: Department 329, Newark 1, New Jersey.

PACKED WITH FEATURES: ■ **DUAL MECHANISM for higher, interrupting ability.** ■ **TEASE-PROOF "Quick-Make, Quick-Break" operation for long life.** ■ **FACTORY-SEALED adjustable Thermal-Magnetic Interchangeable Trip prevents tampering.** ■ **INSTANTANEOUS deionization arc quenching assures longer contact life.** ■ **UNIQUE triple lug design permits wide selection of cable sizes.** ■ **SILVER-TUNGSTEN contacts provide high conductivity, low contact resistance.** ■ **RUGGED construction, high dielectric molded phenolic case.** ■ **UL APPROVED. Conforms to Federal Specification W-P 131a, Amendment 2 as Class D and Class E breaker.** ■ **INTERRUPTING RATINGS: 50,000 amps at 240v a-c, 35,000 amps at 480v a-c and 25,000 amps at 600v a-c.**

FPE **FEDERAL PACIFIC ELECTRIC COMPANY**

The Best in Electrical Distribution and Control Equipment

For more facts circle 563 on Reply Card

WHAT'S JUST AHEAD IN THIS ISSUE?

- MAINTENANCE gets another helper . . . . this time, a communications system that gets the service messages down on paper. Boeing has been using it successfully for some time; they say it gets results. For the complete story, turn to page 92.

- NEED EMERGENCY D-C? You probably have all the equipment you need to make a d-c generator to help out during emergencies. One plant engineer changes a few connections on a standard motor-generator arc welder to supply d-c power when needed. Nobody is bragging about efficiency with this hookup, but it sure comes in handy. Story starts on page 94.

- THERE'S BEEN a lot printed, and said, about lubrication efficiency improvement—most of it about lubricant standardization, oiler training and lubrication scheduling. In the article beginning on page 96, the author tells how he went one step further, and applied Methods Time Measurement to the lubrication program in his plant. It worked in his plant, and it should work in yours.

- INSTALLATIONS OF plastic pipe in industrial plants are increasing at an amazing rate. To get acquainted with one type, PVC, read the article beginning on page 107. It discusses various sizes, typical applications, and tells how PVC can be used in your plant.

- BALANCING OF FAN WHEELS can be done in the field. All you have to do is follow the correct procedure. An excellent step-by-step description of just what to do, when, is presented in the article beginning on page 110.

- PAINTING OF external masonry surfaces is really no problem, but selection of the type of paint requires some study. One type suitable for outdoor masonry is latex paint. The article beginning on page 122 discusses the various kinds of paint in the latex group. The author also comments on cement-based and oil-based paints, and discusses surface preparation and efflorescence.

- POWER TRANSMISSION equipment was called upon to do a herculean job at Ford's new glass plant in Nashville, Tennessee. It was important that the transmission equipment move heavy glass sheets at a steady pace, provide flexibility as well as ease of maintenance. Ford's plant engineers feel that the equipment selected for the job meets all the requirements. For more information, turn to page 126.

The same hard-surface concrete used in the plant area is also being used on the roadbed of the plant's railroad system, which requires a smooth, even roadbed to prevent jostling of loads.

CAT'S STEEL TEETH CAN'T CHEW THIS FLOORING

Grouser shoes from big tractors chewed up old floors. Plant engineers' search turned up a hard concrete flooring that is giving good service

AS TRACTORS roll away from the assembly floor of the Caterpillar Tractor Company plant in Peoria, Illinois, the cutting and pressure caused by the tractor treads give the plant floor real punishment. Only six years ago, this maintenance problem gave plant engineers a headache. Replacement of some floors was necessary three or four times a year.

Now, however, an emery aggregate concrete has helped lessen the problem. A ¾-in. layer of this concrete, spread over the base concrete, withstands the wear from track shoe grousers hardened to a Rockwell 55.

The weight concentration caused by grouser contact only gave short life to much concrete. When the original floors were poured on ground level, they were 8-in., 6000-lb concrete. After several years, these floors had to be replaced in the heavy wear areas.

Original areas of concrete broke on the surface first, then the wear became progressively worse, the base slab itself began to crack. Originally, replacement was with a new concrete base, 8 in. thick, and a protective wood block surface. The wood blocks prevented breakup of the base concrete, but required replacement every few months.

Replacement costs were high. Plant engineers realized that concrete alone, or concrete with wood block surface, was not the answer.

In the search for a type of flooring that would withstand the extra heavy duty wear, a test patch of a low-water ratio concrete made with a graded emery aggregate was installed by the dry tamp method. This is sold under the trade name Emeri-Crete.

Plant engineers and the construction superintendent made regular inspections during the two-year test period. At the end of that time, the patch was still holding up well. What wear had taken place was

evenly distributed over the entire surface and amounted to only a few fractions of an inch. On the basis of this test, Caterpillar decided to use emery aggregate flooring in more critical plant areas.

The concrete foreman supervised his crews to be sure the concrete was installed according to the manufacturer's specifications. After the wood blocks were removed, the base slab was inspected for possible damage. Where damage had occurred, the base slab was broken up and replaced. New base slabs were poured ¾ in. lower than the finish floor level.

On new base slabs, the surface was roughened with a rake before it had taken its final set. Screed strips, ¾ in. high, were set up not more than 8 ft apart. Concrete mix is two bags of Type "C" emery aggregate to one bag of Portland cement. Since dry tamp concrete has greater compressive strength, not more than 3½ gallons of water was used for each bag of cement.

When production schedules demanded that the flooring be placed in use quickly, high-early-strength cement was used. This meant the area was put back into service within 52 hours, permitting an over-the-week-end job.

The dry mix was spread evenly over the base course, and immediately screed to the proper level, the edges well tamped and the entire surface rolled with a heavy roller. After rolling, the concrete was then floated. Finally, the entire surface was hand-trowelled at least twice to produce a hard finish.

In areas where the wood blocks had been removed and the base slab was in good condition, the slab had to be scarified before the concrete was laid. The roughened base slab was thoroughly soaked for 24 hours and cleaned with clear water and stiff brushes or by high-pressure streams of water just prior to application of the concrete.

When required, immediately before application of the concrete, a fill was applied to bring the base to within ¾ in. of final floor level. As soon as the fill reached its initial set, the concrete was applied.

Between seven and eight bags of Portland emery aggregate are needed for each 100 sq ft of flooring. The floor is then cured by standard methods. Light traffic areas are placed in service after approximately seven days. The areas made with high-early-strength cement are usually placed in operation within 72 hours after laying.

The "D9" diesel tractor weighs approximately 60,973 lb. The "D8" weighs 42,000 lb. Grousers on the tracks of these machines are made of extremely hard heat-treated steel. Put all this together and you will have a good idea of the amount of punishment these floors have to withstand.

Steel railroad tracks also posed a problem in the plant. Caterpillar runs an intra-plant railroad to handle waste material, partial assemblies and finished engines. One of its important operations is the movement of raw material from storage yards to the machine shops and from the machine shops to the various assembly points.

Thirteen trains are operated over six miles of narrow gage tracks. More than 9,000,000 lb a day are handled by these trains. There are over 400 cars which were built by Caterpillar. Each car can carry 20 tons. Although the cars roll along rails which are set flush with the concrete yard and shop areas, they are pulled by industrial tractors with rubber-tired wheels. Tractors have a drawbar pull of 7500 lb.

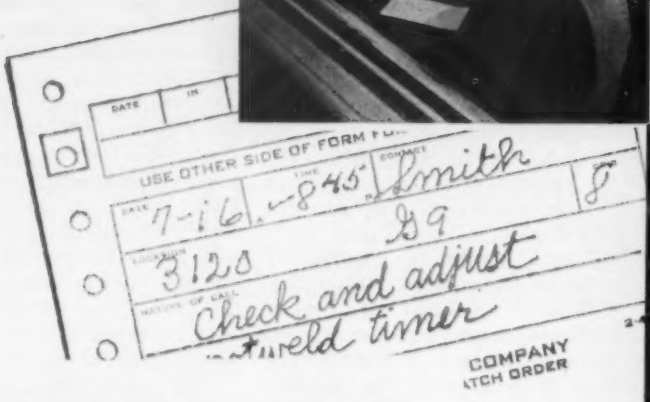
The tracks are placed in the concrete for two reasons. There is a smooth surface for trucks and personnel that cross the rail areas, and smooth surfaces are necessary to eliminate bumping and jostling of the usually heavily loaded cars. If the concrete area around the rails is broken or uneven, the tractor pulling the train will jerk and jolt along. These areas are also being surfaced with this concrete to provide a smooth roadbed. **End**

Steel treads can really chew a concrete floor to pieces. However, they have met their match in the hard-surface concrete which has been taking this kind of beating without damage.

Ramps leading out of plant require traction grips for the big machines. Here, steel rails have been laid and imbedded in concrete to prevent the tracks from breaking the surface.

Incoming telephone requests for maintenance are received by dispatcher. Using transceiver, he sends message to proper station.

Maintenance electrician checks message in the receiver in his section to determine what tools will be needed to service call.



MESSAGES SEND MAINTENANCE MEN TO THE JOB—DIRECTLY!

By **LOGAN D. GARRISON, General Superintendent, Plant Service Section, Facilities Department, Boeing Airplane Company**

A COMMUNICATIONS SYSTEM designed specifically to improve maintenance by our Plant Service Section saves about $16,800 operational dollars over and above its cost every year at Boeing Airplane Company's Seattle plant.

Moreover, the system has eliminated confusion in follow-up on "trouble reports." It has improved supervisory control and has made it possible for maintenance personnel to make more service calls daily. Less time elapses between receipt of a call for maintenance attention and arrival of a maintenance technician at the trouble spot. This often is translated into production savings and reduced downtime.

Every maintenance dispatch is received and monitored in our supervisory maintenance office for control and record purposes.

These results have been achieved by replacing a telephone dispatching system with a method which transmits written instructions. A single central dispatcher receives and transmits to outlying maintenance stations all trouble reports and/or requests for maintenance service.

8000 Service Calls Monthly

If no one happens to be at a plant service center at the time a maintenance dispatch order is transmitted, the order simply remains in the receiving unit at the station. It stays there until arrival of a maintenance technician who will act on it. No time is lost trying to locate a technician to relay the order to him. With this routine, an average of 8000 maintenance calls monthly are processed by three dispatchers —one on each shift.

The system is built around Tel-Autograph equipment which enables a person to write a message at one location and have it simultaneously reproduced anywhere in the 13-station system. Involved are a single transceiver, which both sends and records messages, and 12 receivers.

The transceiver is located in our Central Dispatching Office, where all maintenance calls are received. Eleven receivers operate in 11 maintenance stations strategically located in separate sections of our sprawling plant. The 12th receiver is the supervisory monitoring unit in our Maintenance Office.

If the dispatcher is not rushed, he can begin writing our Instan-Form Plant Services Dispatch Order right on the transceiver while the

person making the report is still on the phone. When the load is heavy, the dispatcher generally has to log the calls before putting them on the machine.

He first ascertains the location of the trouble spot, then simply flips a key on a panel alongside the transceiver. This directs his message to a single receiving station, or to several stations simultaneously. As he writes with a stylus resembling a ball point pen, his message is written simultaneously on the Instan-Form in his own machine, on the receiver in the pre-selected maintenance station or stations, and on the monitor unit in our Maintenance Office.

The dispatcher inserts into appropriate blanks on the dispatch form all necessary basic information. This includes date, time transmitted, the person to be contacted by maintenance personnel, the location of the reported trouble and the nature of the call.

A maintenance man detaches his copy of the form at the maintenance station. If the nature of the call indicates a need for special tools, he procures these before proceeding to the trouble spot. In blanks provided on the form for his use, he enters the date and the time he took the Dispatch Order from the machine.

After the maintenance man's call is complete, he enters the time he completed the job, identifies himself by name, and briefly describes the nature of repairs made or work done.

Once he has "signed off" the form, the maintenance technician turns it in to his supervisor. Supervisors keep these forms as long as they think they may be valuable. They provide a convenient means of checking the volume of work done by all employees under his supervision, as well as by individual maintenance men.

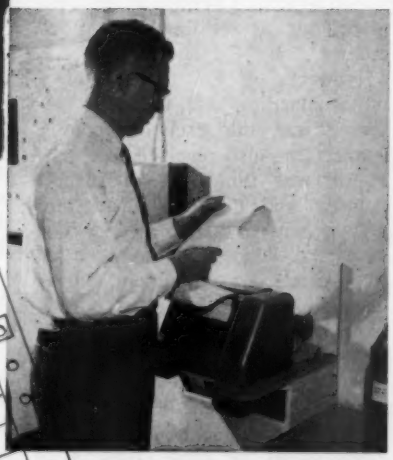
All dispatch orders received on the monitor receiver in the Maintenance Office are filed by date and kept for 30 days as a control.

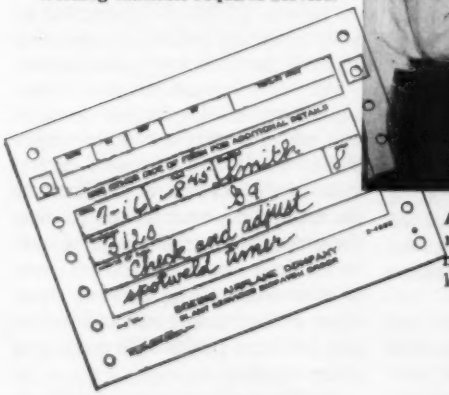
Previously, we tried to do the same job entirely by telephone. We did this by staffing a central office, as presently, to receive all calls and an outlying dispatcher's office as well. On a three-shift operation, this required six dispatchers.

Even with two dispatchers working for each shift, the system was inadequate. Errors sometimes resulted from garbled or misunderstood phone messages. Moreover, it still was necessary for the dispatchers verbally to instruct maintenance men about particulars of each call. This is not easy to do at the same time the telephone is ringing again. There was no convenient form for reports from individual maintenance men pertaining to each call. Supervisory control was loose.

When repeat calls came in, it often was not possible to determine whether the original message had been delivered to a maintenance man. It was virtually impossible to ascertain whether correct information was relayed, even if the dispatcher specifically remembered passing on the information.

Acting on written directions, electrician goes directly to the trouble area. In this case, a spot-welding machine requires service.





All dispatches are duplicated on monitoring receiver in plant maintenance office. Orders are kept on record for one month.

Unit Handles 50 Calls an Hour

With our new system, three dispatchers are adequate to handle our full volume. They can transmit up to 50 calls per hour on the Telescriber equipment, and this has proved adequate. If ever the volume outgrows this capacity, all we need do is install one more transceiver.

By reducing the number of dispatchers required, we have saved 120 operational man-hours weekly. Including overhead costs involved, this represents a $20,300 operating dollar reduction. Taking into account the cost of the system, this gave us a direct savings of more than $14,000 in the first year. Because the installation charge is not a recurring one, yearly savings now exceed $16,800.

While this saving is significant, it is the operational efficiency of the system which most impresses us. When it is possible for a single 15-cent fuse to blow and stop production of as many as 10 important machines, even a five-minute delay can parlay into considerable expense, an inexpensive and simple repair job. Our system gets our maintenance men where they are needed—fast! And there is a minimum of confusion since the instructions are clearly written. **End**

Fig. 1. Combination welder and emergency d-c power source installed in engine room. Control panel has been modified to accommodate special interlocking required for safe operation.

Have You Considered An ARC WELDER for EMERGENCY D-C?

By **WALTER JACOBY, Supt. of Maintenance, Special Products Division, I-T-E Circuit Breaker Co., Philadelphia, Pa.**

MANY MODERN industrial machines require air to operate lifting, transporting and clamping devices and compressed air is as vital to continuous production as a constant source of electrical power to the machine motors. Plant installations may have two or more air compressors for parallel or standby operation but frequently make no provision for an emergency d-c power supply to furnish excitation current to the motor fields.

Air compressors driven by synchronous motors require a dependable d-c power supply for continuous operation. Without d-c field excitation, synchronous motors cannot be operated and resultant interruption of plant air supplies can seriously cripple production.

How, then, can we provide a reliable alternate source of d-c power with a minimum of expense? The normal characteristics of the arc welder does not lend itself to the constant voltage, variable load conditions required for a standby d-c supply. The generator is designed to reduce voltage at an automatic rate as welding current increases.

However, if the rotation of a motor-generator arc welder is reversed and the exciter armature connections also reversed, the generator will build up in reverse polarity and maintain a constant voltage with a variable load. The generated voltage is high enough to operate d-c equipment during inspection or repair of the normal plant d-c power supply.

With this knowledge of the characteristics of the m-g welder, it seems that it would be possible to arrange the control so that the machine could be used either as a welder or as a standby source of d-c power. This is exactly what we did at the Special Products Division of I-T-E.

Permanently installed in the engine room, Fig. 1, the combination generator and welder provides auxiliary d-c for compressor motors. When a welder is needed in the area, the unit can be rapidly switched to welding and eliminates the cost of connecting and disconnecting a portable machine each time welding operations are performed.

When operating as a constant voltage generator, the unit does not operate as efficiently as a machine designed for generator service. It will, however, provide at full voltage about 30 per cent of the full load rating of the welder without excessive temperature rise. The 400 amp welder used in this installation provides approximately 125 amp at 110 volts d-c. With this machine, we have a 15 kw d-c generator or a 400 amp arc welder by operating a circuit breaker and a pushbutton.

As we planned to install this equipment in the engine room it was obvious that a simple design had to be devised to insure correct switching by operating engineers in the event d-c power failed. To meet these conditions, the generator control circuit was designed to have positive interlocking between operation as a generator and as a welder and provided pushbutton starting in either application.

A schematic diagram of the mo-

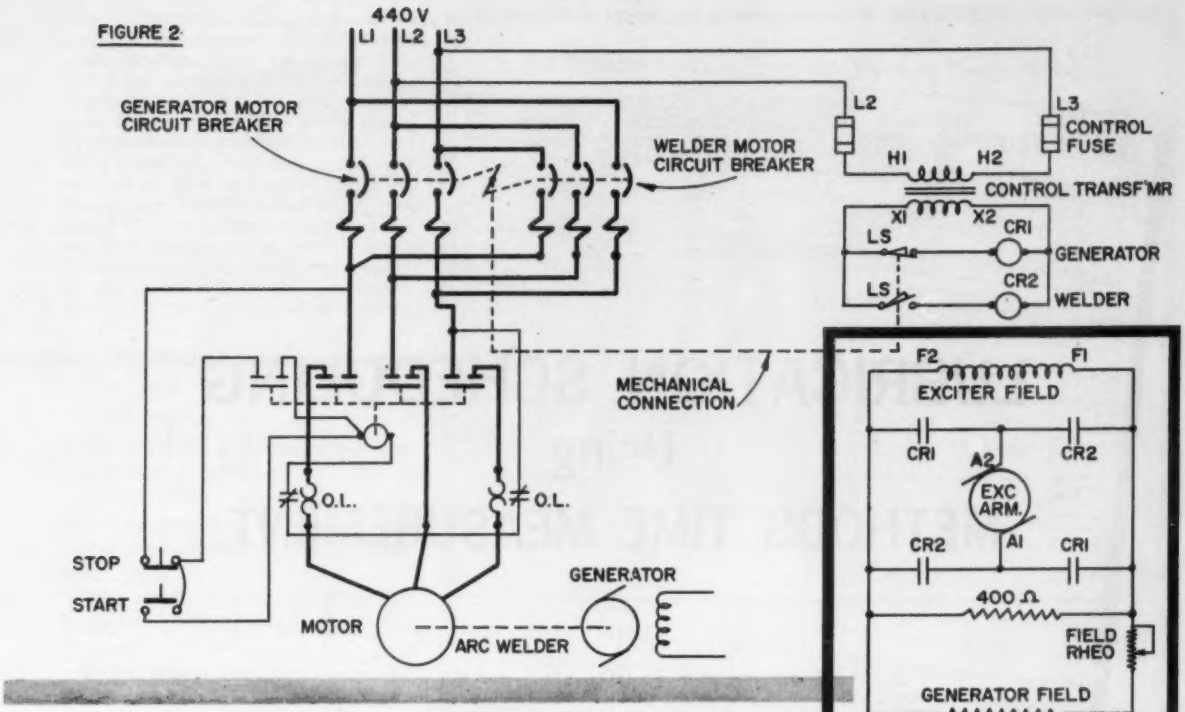


FIGURE 2

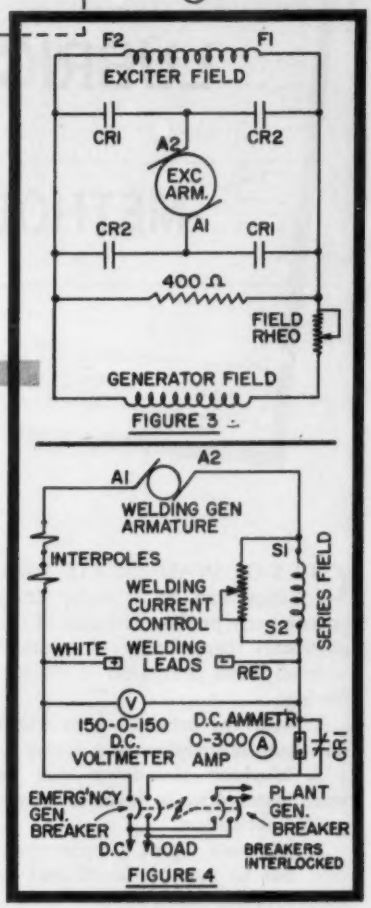


FIGURE 3

FIGURE 4

tor control circuit is shown in Fig. 2. Rotation is changed from generator to welder by operating the motor circuit breakers. These circuit breakers are mechanically interlocked by the cam shown in Fig. 1. The cam is also key interlocked with the plant d-c supply circuit breaker.

One phase of the load side of the motor breakers is cross-connected to reverse the direction of the driving motor. The mechanical interlock cam has a step milled into the rear of it which operates a limit switch. This cam is designed so that only one breaker can be closed and mechanically holds the other breaker open.

Closing the generator motor breaker energizes the line side of contactor M. Pressing the start button energizes the closing coil of the magnetic starter M and the auxiliary contact holds the starter closed until the stop button is operated.

Field connections are shown in Fig. 3. With the machine running in the direction of rotation of a constant voltage generator, the normally closed side of the limit switch energizes relay CR1. Contact CR1 closes the exciter armature circuit to make A1 - F1 negative and A-2 - F2 positive. The generator field is now energized and the generator builds up. A 400 ohm resistor is connected across F1 and F2 permanently to act as a field discharge resistor.

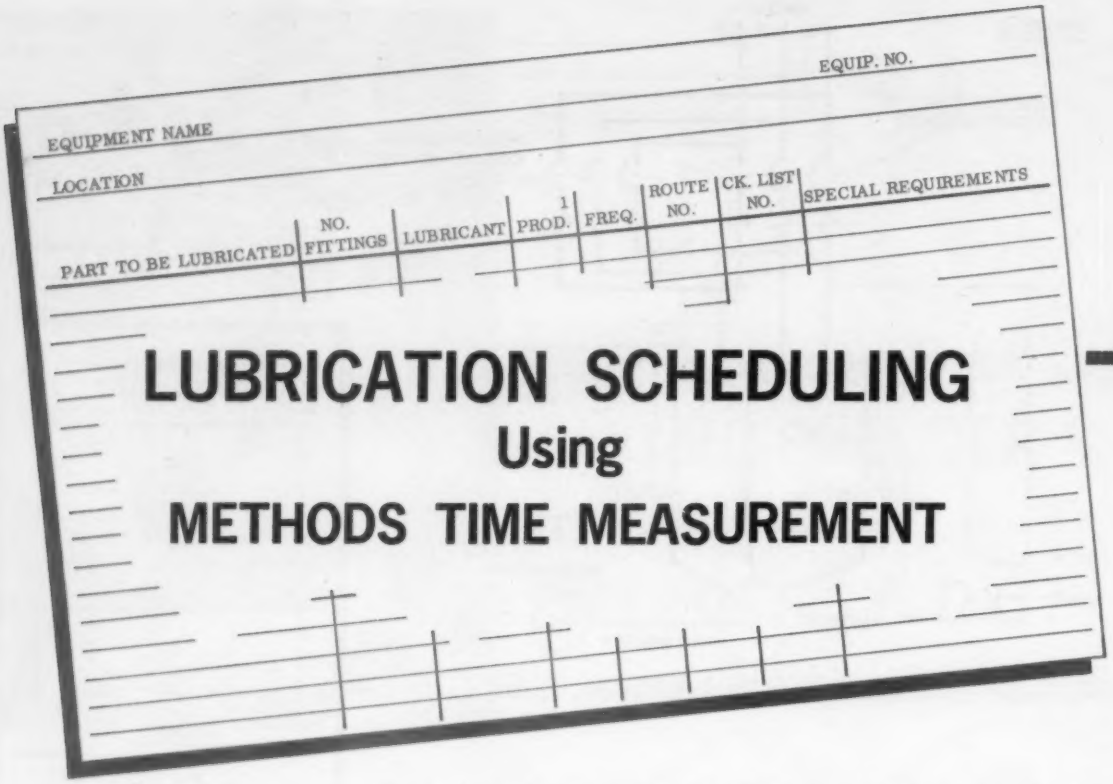
A schematic drawing of the generator armature circuit is shown in Fig. 4. The welding leads are shown but these are not used when the machine is running as a generator. The unit is permanently connected to the plant d-c bus through the generator load breaker which is mechanically interlocked with the plant generator breaker.

Load current is measured by the 300 amp, 50 mv shunt as the CR1 contact across the shunt is open when the machine is operating as a generator. The d-c voltmeter has a zero center scale to permit reading opposite polarities when switching from generator operation to welding.

When operating as a welder, the welder motor circuit breaker is closed to provide the correct rotation. The limit switch operates CR2 to restore the original exciter armature connections, the generator load breaker is left open and the welding leads connected to the machine.

It is not recommended that this m-g set be paralleled with your plant d-c generator as compounding the two generators would not allow a proportionate division of load between the generators. To prevent this, the generator load circuit breaker is mechanically interlocked with the plant generator breaker.

We found the control cabinet modifications and installations cost about 40 per cent of an equivalent bank of rectifiers and controls. The added bonus of its use as a welder, when needed, overcomes thoughts of its inefficient performance as a voltage generator. **End**



LUBRICATION SCHEDULING Using METHODS TIME MEASUREMENT

By TOM MOSTYN, Executive Staff Maintenance Engineer, Rayonier, Inc.

COST OF INADEQUATE lubrication can be a major drain on company profits. The cost of the lubricants themselves is very small —small when compared to the following:

1. Machine breakdown in which improper lubrication is a factor.

2. Machine slowdown due to worn parts due, in turn, to inadequate lubrication.

3. Machine part replacement cost due in part to insufficient or inappropriate lubrication.

4. Labor cost of applying lubricants.

5. Supervision and overhead costs in connection with the lubrication program.

All this is quite obvious. The trouble is that it is next to impossible to determine the actual costs involved in each of the above items. Even if the mechanics know that faulty lubrication has caused a breakdown they are often reluctant to report the fact and get their oiler "buddy" in trouble. Even if maintenance supervision knows where poor lubrication is responsible for a breakdown, they are not likely to go out of their way to report deficiencies in a function also under their supervision. So the chances are that top management which has "control" over expenditures gets to know of very few cases where "lack of lubrication" costs are excessive.

Machine part replacement costs due to inadequate lubrication are even more illusive. Parts wear out whether they are lubricated or not. The life of a part ideally lubricated and one lubricated under normal practices is seldom compared. Service conditions vary so much that it is impractical to separate replacement costs due to lubrication practices. Anyone close to machine maintenance may know of instances where inadequate lubrication costs have been substantial. But usually no one knows just how much it actually costs the company.

Labor, supervision, and overhead costs normally run four or five times lubrication materials cost. But here again few people have bothered to compare these costs. Relatively few companies compute lubrication costs separate from other maintenance costs. Very few know what "par" for lubrication costs should be even for labor and materials. Very few have made a thorough study of the subject.

As a start on a lubrication program, the Grays Harbor Division of Rayonier Incorporated made a survey of some thirty oil companies and lubrication equipment manufacturers. No specific programs were recommended by them. We were referred to six different manufacturing companies known to have definite lubrication schedules. These companies were very helpful in their suggestions. But no lubrication program that covered all of the considerations necessary in our application were forthcoming.

What Should Study Cover?

The objectives of a lubrication program should be laid out first:

1. To reduce maintenance costs, including cost of applying lubri-

Fig. 1. Form on facing page shows points of lubrication, lubricants to be used, etc. The "Prod." in column 4 refers to production—can the machine be lubricated while it is in production or must it shut down? An "R" is placed in this column if it should be lubricated while running; RN means lubricate running or not; and an N means lubricate only when machine is not running. "Ckl" in column 7 refers to the checklist number. After checklists are completed and numbered the number of the checklist is entered on master lube cards in the equipment records.

FIG. 2. MTM Analysis of Applying Grease Gun to Fitting

MOTION	SYMBOL	TMU
1. Stoop to place oil can on floor, release can	S, R	29.0
2. Arise, gripping wiping rag in motion	AS	31.9
3. Grasp fitting through rag	G1A	2.0
4. Turn rag 180 deg to remove grease	T180S	9.4
5. Flip over rag in motion to head of gun	M20A1	19.2
6. Grasp head of grease gun	G1A	2.0
7. Move head to fitting	M5A1	7.3
8. Position head on fitting (bullneck)	P2SE	16.2
9. Reach for gun handle	R10A	8.7
10. Grasp handle		
Pump handle to grease[1]	G1A	2.0
11. Reach for head of grease gun	R10A	8.7
12. Grasp head	G1A	2.0
13. Disengage head of gun	D2E	7.5
14. Stoop to get oil can, grasp	S, G1A	29.0
15. Arise	AS	31.9
TOTAL		206.8

[1]Pump handle is a separate allowance of 20 TMU per stroke, the number of strokes estimated from size and fit of bearing.

FIG. 3. Time Allowances for Lubrication

WALKING (count as a step each time balance is shifted, including sidesteps, turning around, stooping, straightening up, etc.)		
CONDITION A	walking on hard surface with oil can and grease gun or pushing cart, or walking down stairs.	20 TMU/ step
CONDITION B	walking on muddy surface or over cluttered machine parts, climbing stairs.	30 TMU/ step
CONDITION C	climbing ladders, taking cart up stairs (setting ladder requires average of 5 Condition C steps or 250 TMU)	50 TMU/ step
WORKING		
CONDITION A	easy-to-reach grease fittings, check oil level.	200 TMU/ fitting
CONDITION B	difficult position of grease fitting, fitting covered with debris.	300 TMU/ fitting
CONDITION C	oil small chain, fill oil reservoir, fill grease gun at gun filler.	500 TMU/ fitting
CONDITION D	oil large chain, fill grease gun from open bucket, mark checklist.	2000 TMU/ fitting
CONDITION E	check gearcase for water, fill air line lubricators with air pressure off line.	3000 TMU/ fitting
CONDITION F	fill air line lubricators with air pressure on line.	5000 TMU/ fitting
ALLOWANCE PER STROKE OF GREASE GUN		20 TMU

cants, stocking lubricants, machine repair and overhaul.

2. To reduce production costs including machine breakdown and mechanical slowdown due to worn parts.

The means of accomplishing this from the lubrication point of view becomes:

1. To define best lubricants and frequencies of lubrication for each machine.

2. To develop best method of lubricating:

a. Best tools—cheapest tools to use in the long run, all costs considered.

b. Best route—involving the least delay to actual application of lubricants.

3. To develop schedules that represent a fair day's work for each oiler.

4. To select and train oilers in using prescribed methods and schedules.

5. To control results through supervision.

It goes without saying that these things should be accomplished without excessive costs of developing the program, and, particularly, without excessive recurring costs in administering the program.

Define the Job

Before you can develop best methods or schedules, you must decide what work must be done—what has to be lubricated and how often. This is no small part of the total job. In a sizable mill, it takes considerable time to find out just what the practices are if they have not been spelled out in definite terms. General instructions and oral orders could become muddled.

Under an informal lubrication "program" it is not unusual to find different oilers using different lubricants and frequencies on the same application. Obviously different practices can't all be the "best way". But determining what is best from the standpoint of minimum machine operating and maintenance cost takes time. Oil companies can help with a survey. But you cannot follow them blindly. Recommendations must be tempered with experience under your particular service conditions. And

no one oil company has all the best products.

You should be prepared to "engineer" your own program for best results. Furthermore, you should be prepared to alter and improve it as new lubricants are placed on the market. The lubrication program must be flexible to accommodate improvements.

Points of lubrication, lubricants to be used, frequency of application, etc. can be most easily used if the information for each machine is recorded on a separate card, such as the one shown in Fig. 1. Changes on one card do not affect other cards such as would be the case if a list were used. Also, cards can be rearranged in whatever order desired in studying routes, practices with similar machines, machines using the same lubricant, etc. These cards are rightfully a part of Equipment Records and can be filed with the other equipment specifications if the card size is designed for that purpose.

Advantages of Standardization

There are several significant advantages to minimizing the kinds of lubricants used:

1. Lubricant inventories can be reduced.

2. Labor costs of handling many containers and lubricating tools can be minimized.

3. Errors and misapplication of lubricants can be minimized.

4. Chance of lubricant contamination reduced when number of seldom-used containers is reduced.

5. Instructing and training oilers is simplified with fewer products to use.

6. Suppliers are apt to carry larger stocks of lubricants ordered more frequently.

Of course, lubricants should not be misapplied just to standardize. On the other hand, savings from the advantages of minimizing number of kinds of lubricants can often justify the use of a better-than-needed lubricant in some cases. Quite recently several oil companies have placed on the market multipurpose lubricants that can replace most special products. Don't forget, labor costs run three or four times material costs in most lubrication programs.

To develop the best method of doing a job, one must compare the time necessary to accomplish the job with the time of alternate work methods. To determine how long a job should take, and to establish a route that represents a fair day's work for the oilers, you must know the time it takes to do a job. Establishing a realistic time value for lubrication work is the same sort of problem faced in setting production standards. Lubrication tasks are repetitive in the same sense as production work. So we should adopt from production the best time measuring means for our purpose.

What Is MTM?

MTM, or Methods Time Measurement, is a set of established times for the elements of manual work. Much research has gone into developing standard times for typical motions that make up most manual work. By studying a manual task, anyone trained in the application of MTM can outline the motions required. Then by adding the time allowances for the motions, a synthetic time can be developed for performing the task. The time required plus the number of steps to apply a grease gun to a fitting is shown in Fig. 2.

The unit of time used in MTM is one hundred-thousandth of an hour. This unit, called a Time Measurement Unit or TMU, is small and totals of time accumulate into quite a few digits. However, it allows the accuracy necessary for this sort of study, and hours are easily determined by moving the decimal point over five places in TMU totals.

Actually, any reliable method of determining time values for lubrication tasks would be satisfactory so long as the tasks timed are small enough to allow rearranging tasks in different sequences for methods improvements. MTM was used in the Rayonier study because:

1. Building the time standard for different tasks necessitates consideration of motion study. Savings of small increments of time through motion analysis is important when these motions are repeated as often as applying a grease gun to a fitting.

2. Study can be done independent of oilers. Labor is not upset by taking a lot of time studies.

3. Results are consistent regardless of routes developed.

4. Basis of study is objective. Use of published data is often more acceptable than subjective stop watch studies.

Once time values for the various greasing and oiling times have been developed, these times can be added together with times taken up with walking to get times required to cover route. Alternate routes can be developed and these times compared to determine the best route. Time required to cover a route using a cart with needed lubricants can be compared with the time required over the same route with refill stations for hand-carried lubricants. Lengths of routes can be arranged to give the oilers a fair day's work.

Figure 3 is a chart of time allowances for lubricating paper mill type equipment, under conditions found at our mills. The chart is not useful for conditions other than those covered in the particular study. The important point is that such a table can be developed for any lubrication program and its use will lead to a scientific assignment of work that can yield substantial savings.

Finding Best Routes

The routes that grow out of an informal catch-as-catch-can system may not be the least expensive or give the best coverage. At least in the initial stages of the MTM routing it is wise to ignore present practice to give the mind full range in considering all possibilities.

Since labor cost is the most expensive part of even a good lubrication program, routes must involve a minimum of walking time. Isolated areas of the plant are considered first as a route or section of a route to avoid excessive stops by the oiler. If using a cart is impractical because of the equipment layout, routes should be based upon one or two hand-carried lubricants. It is well to start the study in an area most distant from the central "oil house" and work toward the "oil house" so that tag ends of routes can be consolidated.

In any event, methods and route

ROUTE _____ ___ EQUIPMENT RUNNING ___ NOT RUNNING SHIFT_____ DAY _____ PAGE ___ OF _____

CK. LIST NO.	EQUIP. NO.	EQUIPMENT NAME	PART TO BE LUBRICATED	DESCRIPTION OF WORK LUBRICANTS TO BE CARRIED	NO. FIT.	2 100 X WRK. CON.	NO. SHOTS	3 10 X WLK. CON.	NO. STEP	TIME MEASUREMENT UNITS

EQUIP. NUMBER _____ LOCATION OR DEPT. _____

EQUIPMENT DESCRIPTION _____

PART TO BE LUBRICATED	LUBRICANT	FREQUENCY
1.		
2.		
3.		
4.		
5.		

RECORD OF LUBRICATIONS MADE

No.	Date	By	No.	Date	By

Fig. 4. Above: Routes should first be developed by "walking through" and arranging the lubrication equipment record cards in the desired sequence. When the route becomes fairly "firm" list the machine sequence on a route sheet like the one above.

Fig. 5. Right: Lubrication less frequent than one month is listed on a card similar to this and it is placed in a tickler file. When these pop up in the follow-up file it is time to perform this particular lube job.

improvements will become evident throughout the progress of the study so that many alternate routes may be compared on paper. Comparing routes on paper is much more desirable than trying them out with oilers. It is less expensive and much less confusing to the lubrication crew.

Routes should first be roughly developed by "walking through" and arranging the lubrication equipment record cards in the desired sequence. Then when the route becomes fairly "firm" list the machine sequence on the route sheet, Fig. 4. Time values for the entire route can be filled in after counting steps required to walk route.

Totals of TMUs for each lubrication are placed in the next to the last column on the right. Subtotals of lubrication times are entered in extreme right hand column. These subtotals will keep the analyst aware of the elapsed time in each route throughout the study of each route. Subtotals of grease shots will indicate approximately when grease guns must be refilled—where lubrication supplies should be located.

Little difficulty will be experienced in the oiler meeting the time allowances and covering the prescribed routes so long as all necessary lubrications are covered in the study. This is a simple direct study, but it does involve a multitude of machines and lubrication points. Therefore, it is necessary to run a continual check to avoid errors.

To start with, make sure all equipment requiring lubrication is included in the lubrication equipment record cards. This can be done easily in most plants by using existing equipment lists and then checking the cards in a physical sweep of the plant. From then on in the study, each step is keyed to the appropriate lubrication equipment record card. A review of these cards at the end of the study will show up any time or machines left out. In this way, errors can be controlled and minimized.

Definite and explicit instructions should be given oilers. Yet administration costs should be kept to a minimum. Two different types of lubrications normally exist from the administrative point of view:

1. Routine lubrication—frequent lubrication with routing, methods, tools, planned in detail.

2. Periodic lubrication — infre-

LUBRICATION ROUTE SCHEDULE

ROUTE Wood Mill DAY Tuesday

6:00 AM	Pick up weekly lubrications (not running) along daily (not running) route.	
		1140—20' Barker carriage—top side.
	DAILY ROUTE	1140—20' Barker—Gear cases for daily route equipment.
		1774-1775—Wet conveyors under barker, gear reducers.
		1711—Log haul from cutoff saw, gear reducer.
		1710-1708—Roll cases at cutoff saw.
		1706-1707—Log hauls.
		1713—Roll case at 20' barker, reduction gear.
		1757—Log haul to 8' barker, reduction gear.
		1762—8' Log storage deck, reduction gear.
7:00 AM	DAILY ROUTE	1240—8' Hydraulic barker, nozzle trunnions.
		—8' Hydraulic barker, top side, swing joints, solenoid valve.
		1240—8' Hydraulic barker, top side carriage.
		1176—Cant offbearing table.
		1729—Cant transfer from band mill, head pulley.
8:00 AM	DAILY ROUTE	1728—Band mill roll case.
		1172—Band mill.
		1718—Chip conveyor under 153" chipper.
	By 153" chipper, up steps, along south side of 2nd floor.	
		1717-1716—Roll cases, roller chains.
	Out south door, around 20' barker, down log hauls.	
		1328—Bundle deck crane—Wheel bearings.
		—Drive
		—Brake
		—Cable returns
		—Hoist
		—Lower block
9:00 AM	To north end 2nd floor bundle deck.	
		1216—Slasher, roller chain.
		1757—8' Log haul to hydraulic barker.
	Up north walkway by 20' log hauls.	
		1709—East roll case at cutoff saw—roller chains.
		1713—Roll case at 20' barker—roller chains.
	Around end of 8' hydraulic barker.	
		1757—Log haul to 8' hydraulic barker.
		1722—East log and cant roll case—roller chains.
10:00 AM	LUNCH TIME	
10:30 AM	Second floor wood mill—northeast corner and down band saw line.	
		1762—8' Log storage deck—roller chains.
		1759—Transfer to 8' hydraulic barker.
		1729—Cant transfer from band mill.
		1723—Center and cant log roll case.
	Out northwest corner of second floor wood mill.	
		1792—Chip screens over conveyor to refuse-roller chain.
		1365—Canting gear over 110" chipper.
	DAILY ROUTE.	(Equipment Running) Ditto Monday.
11:30 AM		
12:00 N	DAILY ROUTE Drum barker.	
12:30 PM	Clean oil storage areas, get supplies, perform monthly and periodic lubrication.	

quent lubrication; fill-in work to regular routines and/or working foremen.

Checklists are a natural means of assigning highly repetitive routine lubrications at low administration cost. Once a checklist is made up, it merely has to be reissued regularly. There is no searching of equipment records or other files and listing lubrications for the day.

The checklist also "locks in" the best route and schedule developed as part of the methods study. It makes it easy for the oiler to stick to the desired routes. He merely follows the numbered sequence of checklists posted in the mill.

Checklists cannot give all the instructions necessary. A description of work methods in a maintenance manual can do that. However, the checklists do act as a reminder and keep lubrication from drifting into poor practices.

Lubrication checklists marked by oilers also tell supervision what is being lubricated—and what is more important, what is not being lubricated. This record does not do away with the need for direct supervision. However, it does make supervision easier and facilitates on-the-job training of oilers.

The labor cost of oilers marking checklists is insignificant when compared with the positive savings this practice can insure. At Rayonier, actual time taken to mark checklists amounts to approximately 6 per cent of oilers' time on the job. Walking time on the other hand consumes almost 60 per cent of some oilers' time. It is easy to see that it takes very little reduction in walking time to pay for the use of checklists. If the use of checklists sequenced in the shortest route can help avoid use of alternate longer routes, the time required to mark checklists is well spent.

Furthermore, the checklist facilitates the following of improved methods developed in the over-all

Fig. 6. A daily lubrication route schedule such as the one shown on the facing page helps to spot inequities or possible improvement in routes. It also helps supervisors understand routes and lets them know where oilers can be found at any time during the day.

study. Checklists are the teeth in the gears of the lubrication program. In the first route developed at Grays Harbor Division of Rayonier, labor savings of 43 per cent were realized and, in addition, lubrication practices improved. The use of checklists will help perpetuate these savings and act as a base for further improvements.

Checklists are not the answer for seldom-repeated lubrications or periodic lubrication. The long cycle makes the checklists too lengthy and cumbersome to use. Any lubrication less frequent than once a month is listed in a tickler file at Rayonier. Cards similar to Fig. 5 are filed under the month the next lubrication is due for each machine. The lubrication leadman maintains the file and assigns work from it as fill-in-work to the regular schedules.

As a lubrication is completed, he fills in the date of the lubrication, type of lubrication made and files the card under the next month that lubrication is due. He makes sure all cards are out of the current month file by the end of the month. Then he shifts the month divider to the back of the file ready to receive cards due that month on the following year.

In this way, he always has just the cards showing need of equipment lubrication for a particular month. No need for reviewing all periodic lubrications to pick out the assignments for one month. Supervision can review cards to determine how completely each piece of equipment is being serviced.

At Rayonier, six hours of routine lubrication were scheduled for each day. The other two hours were allowed for unavoidable delays (plugged fittings, production calls), personal time, replacing supplies, cleaning lubricating equipment, periodic lubrication assignments. The ratio of periodic lubrication time to routine lubrication time pretty much determines the number of hours each day you can schedule routine work. A rough comparison of the TMUs involved in periodic and routine lubrication will usually suffice in setting a "cut-off point" in daily routine schedules.

As routes are built and times accumulate, an over-all picture of crew requirements will emerge. Basically, the number of routes will determine the number of men required in the crew. At this point in the study, thought must be given to possible shift schedules which may be made necessary by production schedules, premium pay hours scheduled, oilers' days off, etc. Individual routes should be balanced. Equal amounts of scheduled work should be assigned to all oilers if possible.

A daily lubrication route schedule shown in Fig. 6 helps to spot inequities or possible improvements in routes. It also helps supervisors understand routes—gives them a schedule of where oilers are likely to be found any time of day.

Checklists should be made only after all routes have been accepted as the best method and schedule of lubrication. Then, start with the Monday route and fill out the checklists keeping in mind the best positions for the lists in the plant. Ozalid or other black line producing process provides a print that will stand up for the month that posting is required. In any case, originals should be easy to change so that there is no deterrent to keeping checklists current.

Periodic lubrications can be entered on tickler cards after checklists are completed. Then, the supervisor of the lubrication crew should place the cards in the file for the next month he plans to perform each periodic lubrication. An effort to spread out the periodic lubrications among all months will insure an even loading of the lubrication crew in this type of work.

Accompany Oilers on Route

After a "how, why, when, where, who" discussion with the people involved, checklists should be mounted in the plant. It takes less time to mark mounted sheets, is less cumbersome for the oiler, and is less likely to cause mixed-up or lost sheets. Permanent mounting of checklists also facilitates close supervision—stimulates interest in lubrication on the part of production foremen. When approached properly, oilers will not resent the change, particularly if improved methods make their job easier and if an opportunity for advancement is given to displaced oilers.

Whoever developed the route sheets should accompany oilers on their first rounds of the new routes. It may be difficult to complete routes at first because of delays involved in becoming familiar with them. Usually, oilers can keep on the schedule after the second or third week.

Throughout a detailed study such as this, it is important to keep in mind the intent of the program:

1. Minimize equipment failures due to faulty lubrication.

2. Facilitate effective supervision and training of oiling crews.

3. Reduce lubricant inventories.

4. Minimize lubrication crew size.

5. Provide basis for future lubrication improvements.

It is easy to get so involved in details that the real objective is lost. Revisions for improvement should be reflected in all steps of the procedure as soon as they are adopted. Checklists should specify current desired practices. Oral revisions to checklists should be avoided or they may become meaningless.

The procedure for improving lubrication practices and reducing lubrication man-hours is useless unless followed. It is not enough to merely "engineer" the job. It must be sold to all concerned and in time adopted by supervision as its own. Once foremen and their men understand the reasons for the program and the way it is supposed to work, they can be expected to go along with it on a trial basis. Only experience with it will lead to active support. The system is just the tool; people must actually produce results and make benefits into profits. **End**

How Western Electric Decides WHICH AIR FILTER WHERE

They use these methods of determining filter efficiency: 1. Weight and 2. Discoloration

By P. M. TESTER, Plant Engineer, Plant Design and Construction Div., Western Electric Co., Inc., New York

EFFICIENCY OF an air filter would seem to be easily determinable. Efficiency, by ordinary definition, is defined as the ratio of output to input; however, when applied to air cleaning, "input" is the amount of atmospheric dust contained in the entering air while the "output" is the amount of dust retained by the filter. The difficulty is in finding a method which will evaluate the dust content of the air.

The reasons for this difficulty is that dust constitutes a complex mixture in a wide range of particle sizes that can vary in content and concentration with the location, the season, wind velocity and direction, weather conditions and time of day. Furthermore, dust is invisible in suspension—which makes the problem increasingly more difficult.

Particulate matters in suspension are called aerosols, and constitute smokes, dusts, mists and fumes, but may include particles of almost any inorganic and organic material and even such living organisms as virus, bacteria and fungus spores. This wide variety of atmospheric constituents make it impossible to design one type of air filter which will be best for all applications.

Several test procedures have been developed—count, weight, visual comparison, and discoloration—but no one gives a complete answer for all types of air filters. We have concentrated on the weight and discoloration methods to determine which filters will best serve our needs.

Characteristics other than efficiency are also considered by Western Electric engineers. Dust holding capacity is an example.

Dust arrestance is a percentage relation between the dust fed to the device as compared to the dust passing the device and is expressed in the following formula:

$$E = \frac{1-Q2}{Q1} \times 100$$

Where Q1—weight of dust fed
Q2—weight of dust passing the device

For filters of the viscous impingement and dry types, which are intended for the removal of the coarse, settling type of dust, a test method

Table shows the items considered in the analysis of four types of filters. After careful consideration, the company se-

Type of Filter	Type of Maintenance (Proposed)	Initial Cost For All Systems for 743,100 cfm	Usage Period	No. of Washings (10 Years)	No. of Replacements	Total Washings & Replacements	Cost of Media (10 Years)	Labor Cost (10 Years)
A	Wash (or vacuum) media at end of first and second loads, replace at end of third load period	$27,310.00	4 weeks	87	43	130	$ 18,000	$31,800
B	Replace media after each load	25,000.00	5.4 weeks	none	97	97	41,500	24,800
C	Wash media at end of each of 20 to 25 loads; then replace	28,103.50	15.4* weeks	31.7	2.1	33.8	12,700	8,200
			13.8** weeks	35.91	2.39	38.3	15,900	9,250
D	Replacement of media cartridge	34,504.99	24 weeks	none	21.6	none	145,500	3,200

Notes: *Assume 100 per cent clean after washing **Assume 10 per cent dust remains after washing

based on weight and use of synthetic dust is most applicable.

Dust holding capacity as taken by standard test procedures means the amount of dust, in grams, a particular filter unit can hold when the filter reaches a resistance of 0.5 in. water gage.

Weight Method of Determining Efficiency—This is an accelerated test method using a synthetic dust mixture to establish an arrestance rating and the rise in resistance with dust accumulation for the purpose of comparing the relative performance of two or more filters of similar design.

The components of the dust mixture are selected to simulate the type of dust that the filter will be expected to remove when it is put into actual service. For atmospheric dust, the mixture usually includes a combination of carbon black, Pochahontas ash, Arizona road dust and cotton linters.

A known weight of the standard dust mixture is introduced at a predetermined rate into the air stream ahead of the filter and from the weight of dust samples taken on the clean-air sides of the filter, a percentage of arrestance can be determined.

The American Society of Heating and Ventilating Engineers Code Method uses a calibrated orifice on the downstream side of the filter to concentrate the low dust content in the cleaned air. A sampling tube center in this orifice is connected to a small thimble-like ceramic crucible through which air samples are drawn during the test. From the increased weight of the crucible and other known factors, it is possible to calculate the percentage of arrestance of the filter.

The Air Filter Institute Code also uses a synthetic dust mixture and employs the same method of introducing the dust into the air stream but has replaced the orifice and sampling tube with an "absolute filter" to catch all the dust that escapes the filter. Its weight increase compared with the weight of the dust introduced establishes the percentage of arrestance. The AFI Code also recommends a vertical test duct to eliminate the need of accounting for the dust that settles out in a horizontal duct.

Other advantages of the AFI Code are that it simplifies the testing procedure, minimizes the chance for error, eliminates the need for an experienced technician and provides a method by which duplicate results are readily obtainable.

Since with either the ASHVE Code or AFI Code determinations are made by weight, it is possible to raise or lower the arrestance factor by varying the constituents of the test dust. In comparing the arrestance of competitive factors, it is necessary to know that the same procedure and the same dust mixture were used in all tests.

Discoloration Method of Determining Efficiency—With the advent of electronic precipitators for ventilating and air conditioning service, it was found that the weight method failed to show the true effectiveness of this air cleaner. Unlike mechanical air filters, the efficiency of a precipitator is not influenced by the mass or density of the dust particles. It will collect particles smaller than tobacco smoke which averages about ¼ micron or 1/100,000 of

This is the 50,000-cfm air filtering installation for the air conditioning system at the Allentown Works of the Western Electric Company, Allentown, Pennsylvania.

lected filter "C" for use in the air conditioning system for its Allentown plant.

Water Cost 10 Years) (20 gpm/filter)	Total	Fixed Charges†	Yearly Cost	Total Yearly Cost
$388	$ 50,188	$2,900	$ 5,018	$ 7,912
—	66,300	2,650	6,630	9,280
94	20,994	2,980	2,099	5,079
—	25,256	—	—	—
—	148,700	3,660	14,870	18,530

†Includes depreciation, interest, insurance and taxes

How Western Electric Decides WHICH AIR FILTER WHERE

They use these methods of determining filter efficiency: 1. Weight and 2. Discoloration

By P. M. TESTER, Plant Engineer, Plant Design and Construction Div., Western Electric Co., Inc., New York

EFFICIENCY OF an air filter would seem to be easily determinable. Efficiency, by ordinary definition, is defined as the ratio of output to input; however, when applied to air cleaning, "input" is the amount of atmospheric dust contained in the entering air while the "output" is the amount of dust retained by the filter. The difficulty is in finding a method which will evaluate the dust content of the air.

The reasons for this difficulty is that dust constitutes a complex mixture in a wide range of particle sizes that can vary in content and concentration with the location, the season, wind velocity and direction, weather conditions and time of day. Furthermore, dust is invisible in suspension—which makes the problem increasingly more difficult.

Particulate matters in suspension are called aerosols, and constitute smokes, dusts, mists and fumes, but may include particles of almost any inorganic and organic material and even such living organisms as virus, bacteria and fungus spores. This wide variety of atmospheric constituents make it impossible to design one type of air filter which will be best for all applications.

Several test procedures have been developed—count, weight, visual comparison, and discoloration—but no one gives a complete answer for all types of air filters. We have concentrated on the weight and discoloration methods to determine which filters will best serve our needs.

Characteristics other than efficiency are also considered by Western Electric engineers. Dust holding capacity is an example.

Dust arrestance is a percentage relation between the dust fed to the device as compared to the dust passing the device and is expressed in the following formula:

$$E = \frac{1-Q2}{Q1} \times 100$$

Where Q1=weight of dust fed
Q2=weight of dust passing the device

For filters of the viscous impingement and dry types, which are intended for the removal of the coarse, settling type of dust, a test method

Table shows the items considered in the analysis of four types of filters. After careful consideration, the company se-

Type of Filter	Type of Maintenance (Proposed)	Initial Cost For All Systems for 743,100 cfm	Usage Period	No. of Washings (10 Years)	No. of Replacements	Total Washings & Replacements	Cost of Media (10 Years)	Labor Cost (10 Years)
A	Wash (or vacuum) media at end of first and second loads, replace at end of third load period	$27,310.00	4 weeks	87	43	130	$ 18,000	$31,800
B	Replace media after each load	25,000.00	5.4 weeks	none	97	97	41,500	24,800
C	Wash media at end of each of 20 to 25 loads; then replace	28,103.50	15.4* weeks	31.7	2.1	33.8	12,700	8,200
			13.8** weeks	35.91	2.39	38.3	15,900	9,250
D	Replacement of media cartridge	34,504.99	24 weeks	none	21.6	none	145,500	3,200

Notes: *Assume 100 per cent clean after washing **Assume 10 per cent dust remains after washing

based on weight and use of synthetic dust is most applicable.

Dust holding capacity as taken by standard test procedures means the amount of dust, in grams, a particular filter unit can hold when the filter reaches a resistance of 0.5 in. water gage.

Weight Method of Determining Efficiency—This is an accelerated test method using a synthetic dust mixture to establish an arrestance rating and the rise in resistance with dust accumulation for the purpose of comparing the relative performance of two or more filters of similar design.

The components of the dust mixture are selected to simulate the type of dust that the filter will be expected to remove when it is put into actual service. For atmospheric dust, the mixture usually includes a combination of carbon black, Pochahontas ash, Arizona road dust and cotton linters.

A known weight of the standard dust mixture is introduced at a predetermined rate into the air stream ahead of the filter and from the weight of dust samples taken on the clean-air sides of the filter, a percentage of arrestance can be determined.

The American Society of Heating and Ventilating Engineers Code Method uses a calibrated orifice on the downstream side of the filter to concentrate the low dust content in the cleaned air. A sampling tube center in this orifice is connected to a small thimble-like ceramic crucible through which air samples are drawn during the test. From the increased weight of the crucible and other known factors, it is possible to calculate the percentage of arrestance of the filter.

The Air Filter Institute Code also uses a synthetic dust mixture and employs the same method of introducing the dust into the air stream but has replaced the orifice and sampling tube with an "absolute filter" to catch all the dust that escapes the filter. Its weight increase compared with the weight of the dust introduced establishes the percentage of arrestance. The AFI Code also recommends a vertical test duct to eliminate the need of accounting for the dust that settles out in a horizontal duct.

Other advantages of the AFI Code are that it simplifies the testing procedure, minimizes the chance for error, eliminates the need for an experienced technician and provides a method by which duplicate results are readily obtainable.

Since with either the ASHVE Code or AFI Code determinations are made by weight, it is possible to raise or lower the arrestance factor by varying the constituents of the test dust. In comparing the arrestance of competitive factors, it is necessary to know that the same procedure and the same dust mixture were used in all tests.

Discoloration Method of Determining Efficiency—With the advent of electronic precipitators for ventilating and air conditioning service, it was found that the weight method failed to show the true effectiveness of this air cleaner. Unlike mechanical air filters, the efficiency of a precipitator is not influenced by the mass or density of the dust particles. It will collect particles smaller than tobacco smoke which averages about ¼ micron or 1/100,000 of

This is the 50,000-cfm air filtering installation for the air conditioning system at the Allentown Works of the Western Electric Company, Allentown, Pennsylvania.

lected filter "C" for use in the air conditioning system for its Allentown plant.

Water Cost 10 Years) (20 gpm/filter)	Total	Fixed Charges†	Yearly Cost	Total Yearly Cost
$388	$ 50,188	$2,900	$ 5,018	$ 7,912
—	66,300	2,650	6,630	9,280
94	20,994	2,980	2,099	5,079
—	25,256	—	—	—
—	148,700	3,660	14,870	18,530

†Includes depreciation, interest, insurance and taxes

an inch in size. These tiny particles, even in large quantities will not affect the weight of a dust sample, yet they are a definite source of soilage and discoloration.

The U. S. Bureau of Standards developed an accelerated discoloration method for testing air cleaners using Cottrell fly-ash together with a small percentage of lint as the test dust. This discoloration method has been adapted to electronic precipitators using atmospheric dust rather than a synthetic mixture. The results obtained, therefore, are actual operating efficiencies and not arrestance ratings.

With this method, measured air samples taken before and after passing through the precipitator are drawn through white chemical filter paper. The relative discoloration of the "targets" is measured by a photo-electric cell unit, called a Densitometer, to establish values from which to compute the efficiency of the filters.

Viscous filters that have an arrestance rating of 80 per cent or higher may show an efficiency of less than 12 per cent by the Discoloration Test Method. Six-ply dust arresters with an arrestance rating of 94 per cent have an average of 30 per cent by discoloration. This does not discredit air filters, either viscous or dry, for they have proved their adequacy in the elimination of nuisance dust, but instead shows that the additional efficiency of electronic precipitators is obtained in the lower scale of particle sizes.

Determining Dust Holding Capacity—In the laboratory, filter manufacturers use the following procedure to determine dust holding capacity. A dry type filter unit is weighed before placing it in a constant flow air stream. Standard AFI dust is fed at the rate of 30 grams per hour to the upstream side of air chamber.

At various intervals the pressure drop across the filter is recorded and the filter unit is weighed. From these figures we can plot a curve showing resistant versus dust fed. This curve will indicate the amount of dust a filter can retain at various pressure drops. In making a comparative analysis, the amount of dust a dry filter can retain at a pressure drop of 0.5 in. water gage is used.

Comparison of Test Results—In general, there is no one test method which can be universally applied to dry and viscous filters and to electronic precipitators. The ASHVE or AFI test codes or similar weight methods arrive at an "arrestance" factor useful only in comparing the performance of one filter with another when tested by the same procedure and with the same type of synthetic dust.

Actual efficiencies are obtained with the Discoloration Test Method using atmospheric dust but its use is practical only with cleaners capable of removing exceedingly fine dust particles from the air.

The results from one test method are not directly comparable with the results obtained by any other method, nor can they be interpolated to arrive at a common factor of comparison. Therefore, in making comparisons, one must use filters of like nature.

Economic Analysis—It is to be recognized that one of the difficult problems is to select the most economical filter and also one having an efficiency equal to meet the requirements as needed for a particular location. In order to accomplish this, a thorough analysis is usually carried out before a selection is made.

The following examples will indicate this procedure: In the new Allentown manufacturing plant, it was agreed that a filter having an efficiency of 30-35 per cent discoloration or 90 per cent arrestance was adequate for this installation. This efficiency was predicated upon the type of occupancy which did not demand exceptionally high efficiencies and consequently narrowed down the type of filter required. Consideration was also given to maintenance operations, i.e. usage period, ease of handling and extent of cleaning.

The data shown in the table covers the items considered in the analysis which guided Western Electric in the selection of the "C" filter for use in the air conditioning systems for its Allentown manufacturing plant.

It is well to note that although the above analysis proved satisfactory for the Allentown plant, it may not hold for other locations, because of the many variables which may change the requirements.

For the Omaha and Columbus plants, the filter efficiencies are not as critical where the systems are strictly ventilation and consideration leans towards the dry renewable media roll-o-matic type or the viscous oil-bath type of air filter assemblies. Again a similar cost analysis governs our selection. Analyses have also been made for electrostatic filter assemblies in locations requiring dust-free and lint-free atmospheres. **End**

"Honestly, now, isn't it easier to just ask for the afternoon off?"

time saver series

CONSTRUCTION COST ESTIMATING PART 2

CONCRETE SLABS AND ROADS

CONCRETE SLAB

The following factors cover the cost estimating of concrete, placed on the ground in the form of roadways or floor slabs. The table shows how the cost of the 8-in. slab was worked out.

COST OF CONCRETE SLABS

4 in. .....$.392 per sq ft
6 in. ..... .508 per sq ft
8 in. ..... .629 per sq ft
10 in. ..... .738 per sq ft
12 in. ..... .963 per sq ft

These costs are applicable for machine trowel finish, no reinforcing. For broom finish, deduct $.029 from cost figure; for float finish, deduct $.013 from the cost figure.

Machine trowel 1000 sq ft per hr
Hand trowel 600-700 sq ft per hr
Broom finish 1700-1800 sq ft per hr
Float finish 1300 sq ft per hr

Tables on the following page show costs for various types of finishes, reinforcements, expansion joints and saw cutting.

If the concrete is placed on poor ground, usually six inches of bank run gravel is put down first. The cost of placing this gravel with an end loader is $.30 per cu yd, plus $.12 labor, or a total of $.50 per cu yd, including overhead and profit. Using a price of $1.30 per cu yd for gravel, the price of a square foot of gravel, six inches thick, is $.033.

It is sometimes necessary to place a water barrier between the ground and the concrete slab. The cost of 0.004-in.-thick polyethylene film is $.015 per sq ft; installed, it will cost $.035 per sq ft.

Description of work	Dimensions (ft) L	W	T	Extension	Material Cost Unit	Total	Labor Cost Unit	Total
CONCRETE	1	1	.67	.67 cu ft	.47	.318	.08	.054
GRADING	1	1		1.0 sq ft			.03	.030
FINISHING	1	1		1.0 sq ft	.02	.020	.06	.060
TOTAL						.338		.144
OVERHEAD					10%	.034	20%	.028
INSURANCE, Etc.							16%	.028
TOTALS						.372		.200

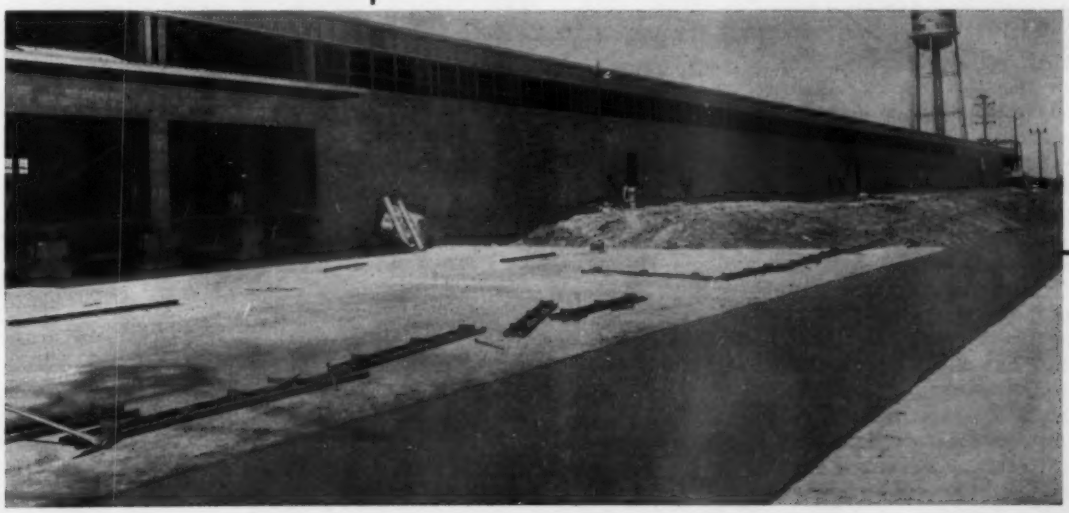
Total Material and Labor Cost: $.372+.200=$.572
Profit, 10%: $.057
Total Cost for one square foot of concrete, 8 in. thick=$.629

Six-bag mix: $12.60 per cu yd. Price varies $.90 per bag of mix. Quick-setting cement will increase costs $1.25 per yd. In many cases, just add an extra bag of cement.

Air entrained concrete, used in outdoor service, is same price as regular mix.

Floor hardener, 70 lb per sq ft: add $1.44 per sq ft

Floor sealer, two coats: add $.03 per sq ft



WELDED WIRE FABRIC

Total costs shown in these tables are computed as follows:

1. Material cost plus 10% overhead.
2. Labor cost plus 20% overhead plus 16% insurance, etc.
3. Sum of 1 and 2, plus 10% for profit, is total price.

Style Designation	Weight per 100 sq ft	Material Cost per sq ft	Labor Cost per sq ft	Total Cost per sq ft
4/4-4/4	85 lb	.094	.020	.14
6/6-4/4	58	.065	.015	.10
6/6-6/6	42	.048	.015	.07
6/6-10/10	21	.025	.015	.05

Add 5% to reinforcing wire quantities, to allow for lap and waste. Price is based on 3- to 5-ton lots.

REINFORCING ROD

Size in.	Desig. No.	Diam. in.	Weight lb per ft	Cost per lb	Material Cost per lin. ft	Labor Cost per lin. ft	Total Cost per lin. ft
¼ rd.	2	.250	0.167	.11	.018	.005	.023
⅜ rd.	3	.375	0.376	.099	.037	.011	.048
½ rd.	4	.500	0.668	.095	.063	.020	.083
⅝ rd.	5	.625	1.043	.092	.096	.031	.127
¾ rd.	6	.750	1.502	.090	.135	.045	.180
⅞ rd.	7	.875	2.044	.090	.184	.061	.245
1 sq.	8	1.000	2.670	.090	.240	.080	.320
1⅛ sq.	10	1.270	4.303	.090	.387	.129	.516
1¼ sq.	11	1.410	5.313	.090	.478	.159	.637

Add 8% to reinforcing rod quantities, to allow for laps.
Price is based on 3- to 4-ton lots; includes labor based on $60 per ton, or $.03 per lb.

EXPANSION JOINTS

In many installations, instead of using asphalt-impregnated fiberboard expansion joints, the concrete is saw-cut after it has set for 24 to 48 hours. The concrete is cut ¼-in. wide and 1 in. deep, and the cuts filled with a premolded asphalt-type filler. The cost to make the cut, including saw rental, saw blade, overhead and profit, is $.36 per lineal foot. The cost of the joint filler installed, including overhead and profit, is $.07 per lineal foot. Total cost, then, is $.43 per lineal foot.

If old concrete is cut, the total cost per lineal foot will be $.58.

Expansion joints should be used for every 400 sq ft of slab. Table shows costs, using asphalt-impregnated joint material.

Size in.	Material Cost per lin. ft	Labor Cost per lin. ft	Total Cost per lin. ft
½ x 4	.07	.05	.162
½ x 6	.103	.05	.201
½ x 8	.134	.05	.239
½ x 10	.165	.05	.292
½ x 12	.196	.05	.330

Construction Joints:
Material cost, $.12 per sq ft; labor cost $.45 per sq ft.
Total cost, $.83 per sq ft, including overhead and profit.

For the "difficult" piping jobs
HERE'S WHAT PVC PIPING OFFERS

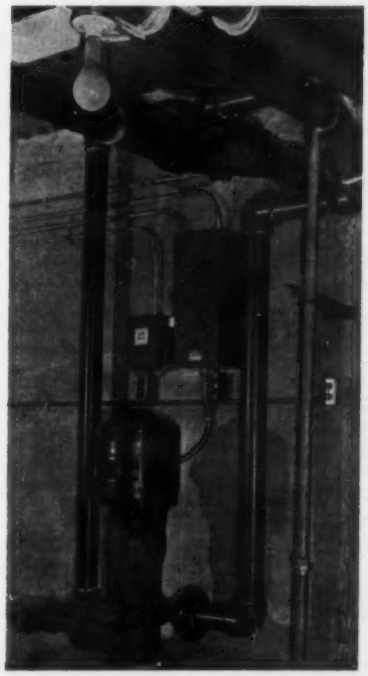
Chemical Resistance
High Strength
Resistance to Weathering
Noncontamination of product

PLANT ENGINEERS are taking another look at polyvinyl chloride piping. They like what they see, particularly in this period of spiraling costs.

PVC piping affords a reliable means of reducing capital spending while improving piping performance at the same time. Consequently, there is a continuing swing to the use of PVC, not merely as a substitute for metal but as an important new piping material with its own unique properties.

Specifically, PVC piping provides:

1. Outstanding resistance to most alkalies and acids
2. Protection against contamination of product
3. High physical strength and toughness
4. Excellent aging and weathering characteristics, and
5. A decided cost advantage over most alloys and non-metallics normally used where corrosion-resistant piping is required.



Three-inch Schedule 80 piping on pump is assembled with threaded fittings.

Present uses as outlined by engineers of Tube Turns Plastics, Inc., include chemical process lines, pharmaceuticals manufacturing, salt water disposal systems, food and beverage processing, industrial drainage lines, water-treatment piping and numerous other applications requiring an economical solution to tough corrosion and weathering problems.

It is now possible to fabricate entire piping systems with polyvinyl chloride. The pipe itself is readily available in all sizes through 16-in. IPS in Schedules 40 and 80, with Schedule 120 available in some sizes, and may also be obtained in other schedules on special order. Molded fittings for solvent welded or threaded connections may be obtained in sizes through 6-in. and flanges are available in sizes to 8-in. Valves, pumps, exhaust blowers and other types of components may also be purchased from a number of reliable companies. Larger fittings are fabricated from sheet or are also available in PVC-lined steel.

Type I (normal impact) is preferred for industrial applications which require excellent chemical resistance together with high strength and creep properties. Type II has greater impact strength over an extended temperature range but shows lower tension and flexural strengths and chemical resistance. High impact is recommended where rough handling is expected and where the installation is likely to be subjected to physical or mechanical abuse as in oil field or irrigation systems. Fittings and other components should be made of the same type resin as the pipe so that chemical and physical properties will be uniform throughout the system.

Applications Are Varied

Polyvinyl chloride piping comes close to being "all things to all men" and it is employed over a broad range of operating conditions. For instance, it is used . . .

. . . By Perfect Circle Corporation for chromic acid and solution purification in plating operations. The PVC piping handles chromic acid in 10-40 per cent concentrations and shows no signs of deterioration after approximately four years of service.

. . . By West Jersey Paper Manufacturing Company for transporting pulp from beater to machine room in the production of automobile gasket paper. The smooth bore of PVC pipe permits stepped-up throughput rates and minimizes clogging due to a buildup of solids. Previously, when carbon steel pipe was used, this had been a particularly costly problem.

. . . By J. A. Maurer Company of Long Island for conveying various solutions used in developing color and black and white film. The solutions range in concentrations and have an average pH of 4.5 to 11.5. By utilizing the chemical inertness of unplasticized polyvinyl chloride,

High-impact pipe, three- and four-inch, handling 35 per cent sulfuric acid.

the company eliminated the possibility of solution contamination due to leaching of plasticizers traceable to the presence of certain alcohols in the developers.

. . . By a major Texas oil company for salt water disposal and for oil gathering lines where corrosion-resistance, paraffin inhibition and economy of installation are of paramount importance. This piping consists of 3800 ft of 3-in. Schedule 40 pipe and Schedule 80 fittings, both made of Type I normal impact material. A three-man crew with no previous experience on PVC installations completed the job in one hour and 45 minutes. The same crew worked four hours and 30 minutes to install a carbon steel screwed line of the same dimensions.

Piping performance has been substantially improved by the switch from steel to plastic. Since PVC is more elastic than steel, salt water lines do not freeze and rupture during normal winter operations. And, PVC is not corroded by corrosive salt water. Paraffin does not build up on the smooth inner walls of the PVC oil-gathering piping and it is no longer necessary to break down the lines every three to four months, as had been the case with the steel pipe system.

. . . By J. H. Erbrich Products Co. in the preparation of a household bleach containing 5.25 per cent sodium hypochlorite. The PVC piping transfers a solution of caustic soda and water from the makeup tank to a mixing tank where chlorine is added, and then conveys the finished bleach to bottling lines. Before PVC pipe and fittings became available, wrought iron threaded pipe and rubber hose had been employed. Both materials were subject to early failure due to the highly corrosive solutions and the presence of chlorine fumes. The PVC piping, on the other hand, has been in service for about five years and there have been no signs of deterioration.

. . . By a large Midwestern manufacturer to handle cooling water. The PVC piping ranges in size from 1 in. through 3 in. normal impact in both Schedule 40 and Schedule 80 PVC fittings in both the socket and threaded types were used. The uninsulated piping conveys cooling water from the roof tower to pump pits in the basement. There have been no failures in the PVC piping because of freeze-up during three years of operation, but a carbon steel feeder pipe connecting the water tower to a city main has frozen and burst several times.

The City of Miami Beach has recently given official recognition to the value of PVC for controlling corrosion in the building trades. Its latest electrical code specifies the use of Schedule 40 unplasticized PVC in all electrical conduit installations where external corrosion is to be expected.

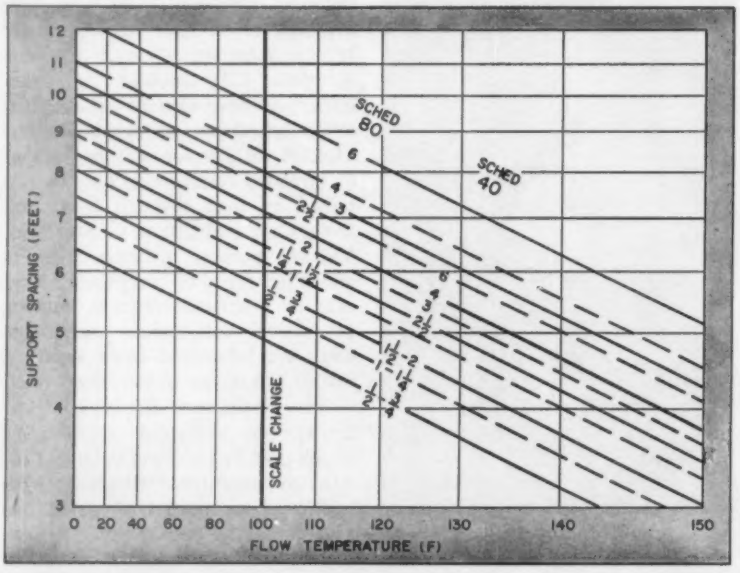
PVC, in spite of its exceptional chemical resistance and low cost, should not be used indiscriminately. As with all materials, the success of an installation is determined to a large extent by the degree of care and skill exercised in designing the system. In other words, let design fit the material; don't attempt to fit the material to preconceived design ideas.

One limitation to keep in mind is the temperature sensitivity of polyvinyle chloride. PVC piping should not be used in drainage lines where the temperature is over 170 F and care should be exercised in pressure lines operating at 140 F to 150 F.

Here are some tips that could lead to savings of time and money:

Joining PVC pipe and fittings may be joined by solvent-cementing, by threading or by hot air gun welding. The best method depends upon the service requirements of the installation. Use of threaded connections should be avoided where the piping is subjected to considerable vibration or extreme thermal cycling. Threaded connections are usually preferred where the lines are frequently disassembled or changed. Generally, solvent cementing results in decided savings in installation costs. In spite of this, threaded PVC

Chart 1. Graph of suggested maximum distances between hangers for PVC pipe.



continues to be a very popular method of installation.

As is the case with metal pipe, threading reduces the effective wall thickness of PVC and introduces notch effects which reduce strength. Threading is recommended only for Schedule 80 or heavier pipe. Insert a tapered wooden or metal plug (longer than the cutting dies) into the end of the pipe to prevent distortion of the wall.

When solvent cemented joints are used, remember to: wipe the surfaces to be mated with a cloth moistened in methyl ethyl ketone or acetone to remove dirt or grease; apply the cement to both the pipe AND the fitting. The cement serves a dual function—fusing the pipe and fitting together, and filling the gap between the OD of the pipe and the ID of the fitting—so a liberal amount of cement should be used. If correctly assembled, a fillet or bead of excess cement will appear.

When the system involves short runs and frequent changes in direction, installation time can often be reduced by precutting the pipe to proper lengths and preassembling the line on the ground or floor.

Support Supports should be placed at intervals of one-third to one-fourth the length normally employed for steel pipe. Chart 1 gives the recommended maximum support spacing for PVC piping at various temperatures. When lines are insulated, the space between supports should be reduced by 30 per cent to provide for the added weight.

The type of hanger employed depends upon the user's preference. Saddle-type and strap-type hangers, as well as hooks, have been used with equal success. Supports should not clamp the pipe tightly.

For short runs of horizontal pipe and for installations to operate at 120 F and above, it is usually better to provide continuous channel support. One company solved its support problem by laying the PVC pipe on top of an existing steel process line and clamping. (But don't place PVC in close proximity to steam lines or boilers.)

It is wise to provide supports at points of directional change, especially from horizontal to vertcal.

Mechanical Abuse PVC is not a fragile material and stands up well when the ordinary rules of good plant housekeeping are followed, but it should not be used as a ladder support or a catwalk.

Expansion The coefficient of expansion of PVC pipe is considerably above that for metal and it is important to allow for thermal change in designing the system. Necessary flexibility may be provided by use of PVC expansion joints, by conventional expansion loops or by utilizing the self-absorption capabilities of the pipe itself.

As a design rule of thumb, allow for ⅓ in. of expansion per 100 ft of pipe per 10F change when working with Type I PVC. When high impact material is being installed, allow for ⅔ in. expansion per 100 ft of pipe per 10F change.

Sound engineering, strict adherence to the principles of design and good judgment on the part of the user will assure the use of PVC piping in those systems where it will do the best job. **End**

Check list on PVC piping covers comparative costs, properties and installations.

MATERIAL COST RATIO	PVC pipe costs 2.3 times as much as galvanized carbon steel pipe.
INSTALLATION COST RATIO	Threaded PVC piping costs 1.5 to 2.0 times as much installed as does galvanized carbon steel pipe.
	Solvent cemented PVC piping costs 0.75 to 1.35 times as much installed as does galvanized carbon steel pipe.
	(Capital cost ratios between PVC and comparable corrosion-resistant materials are not generally applicable because of the numerous variables involved. Ratios given above are provided solely as a general guide.)
USE FOR	Handling corrosive fluids of all types, acids, alkalies, salt solutions and alcohols.
	Handling waxes and other materials that tend to clog metal pipe lines.
	Cooling and process water.
	Drainage piping of all kinds.
TEMPERATURE	Normal impact, up to 150 F for pressure, 170 F for drain lines.
	High impact, up to 130 F for pressure, 150 F for drain lines.
INSTALLATION METHODS	Fittings easily joined to pipe by solvent cementing, threading, heat welding.
	PVC may be joined to metal or other plastics.
TENSILE STRENGTH, ROOM TEMPERATURE	Normal impact, 7000 psi.
	High impact, 6000 psi.
SIZES AVAILABLE	Pipe to 16-in. IPS in Schedules 40 and 80; heavier schedules on special order.
	Fittings through 6-in., Schedules 40 and 80.
	Flanges through 8-in., Schedules 40 and 80.
WEATHERING CHARACTERISTICS	No degradation due to aging when exposed to direct sunlight. Not brittle at temperatures down to —10 F.

Possible Causes of Vibration And How To Correct Them

1. Check for dirty wheel blades and housing

Foreign matter adheres unevenly to the blade, causing an out-of-balance condition.

Corrective measures: Clean thoroughly with safe detergent. Remove dry dust and scale with a wire brush.

2. Check foundation bolts and other hold-down bolts

Loose bolts, improper adjustment of bearing set-collars or shaft rubbing on shaft seals or housing can cause vibration.

Corrective measures: Securely tighten bearing and pedestal mounts as well as fan housing bolts, motor base bolts, fan wheel and sheave set screws and shaft keys. Be careful not to distort the fan housing. Wedge-tighten vibration-eliminator sub-bases with wood blocks if movement is excessive due to improper location and size of isolation pads.

3. Check for assembly misalignment

Wear, shock loads and improper initial installation are among sources of assembly misalignment. Where a flexible coupling is employed, use a straight edge over machined face of coupling halves. Check spacing with feeler or wedge gages at four points, 90 degrees apart. A dial indicator can also be used.

Where sheaves are used, check alignment with string or straight edge. Wherever operating temperatures are appreciably higher than ambient, a "hot check" should be made. This involves sufficient run-in of equipment to bring it up to temperature before checking.

Corrective measures: Adjust driveline components as required to correct any misalignment discovered.

4. Check for sprung shaft or runout in coupling or sheave

Rotate wheel by hand. Holding chalk or red lead pencil firmly, lightly touch shaft (or other moving part if more readily accessible) as it is rotated. If mark is continuous, shaft is likely to be all right. For greater accuracy, use dial indicator to record degree of runout.

Corrective measures: If shaft is bent, an experienced machinist can usually straighten it satisfactorily. If shaft has a sharp kink, it should be replaced. Correct coupling "runouts" as circumstances dictate.

5. Check V-belts for uniformity and cleanliness

Fused joints in V-belts often become hard spots which can set up vibration. Foreign particles wedged in V-grooves, will set up vibration. If sheave is vari-pitched, make sure belts are not riding on hub.

Corrective measures: Clean V-grooves of foreign particles. Replace V-belts with matched set (if necessary).

6. Check for unbalanced motor rotor and/or drive sheave

Loosen and remove V-belts. Operate motor with and without sheave to determine if motor is source of unbalance.

Corrective measures: If vari-pitch sheave is causing vibration, replace with new or rebalanced sheave. Vari-pitch sheaves are especially difficult to balance in the field; it is therefore recommended that these assemblies be returned to the manufacturer for rebalancing. If cast iron sheave is causing vibration, rebalancing can be performed in the field if desired by carefully removing metal by drilling from heavy side of sheave. If motor is unbalanced, send it to a service shop.

7. Check for possible damage to rotating parts

Hoisting of fans with ropes or cables around the shaft bearings or portions of the housing can often cause internal damage that results in vibration. Fans should never be lifted by the wheel or inlets. Severe shock can produce wheel deformation and a resultant unbalance.

Corrective measures: Investigate and repair damage as required.

8. Check fan platforms for sufficient mass or rigidity

Check for platform vibration when fan is down. Other fans, pumps or vibrating machinery in the same plant may aggravate vibration if platform has insufficient mass or rigidity.

Corrective measures: Structural steel platforms should be reinforced with concrete mounting slab of sufficient size to dampen vibration. Filling fan base with concrete may correct difficulty. In some cases, changing fan speed (where permissible) will correct the condition.

HERE'S HOW

AN INDUSTRIAL FAN works at peak efficiency when the wheel is in proper static and dynamic balance. The fan manufacturer takes extreme precautions to insure a balanced condition when the unit is delivered to his customer.

The minute the fan is shipped, however, numerous factors begin to bring about conditions which may lead to undesirable vibration. This may be the result of mechanical factors or may be caused by dirt or other factors tending to put the wheel out of balance.

A fan that is vibrating should first be checked with regard to the points recommended in the boxed section on this page. Before any attempt is made to balance a fan wheel these eight preliminary checks should be made.

Dirt, misalignment, loose bolts and other "external" conditions can produce a severe vibration, which is often readily corrected without resorting to balance weights. Each potential source of wheel unbalance should be carefully checked and all undesirable conditions corrected.

Even after correction of whatever adverse conditions may be found to exist, the fan may continue to vibrate. In such cases, if the fan is "within warranty," the firm that purchased the equipment should contact the manufacturer. If the fan is "out-of-warranty," the steps outlined below are recommended to correct the vibration condition.

Wheel Balancing Procedure

Correction of an out-of-balance condition is not a difficult operation. However, certain precautions should be observed and logical steps must

TO FIELD-BALANCE FAN WHEELS

An Outline of Recommended Procedures

By A. M. WILBUR, Manager, Service Department, American-Standard Industrial Division, Detroit, Michigan

be followed to properly balance the fan wheel in the shortest time, with the least effort and at minimum cost. The elementary procedures outlined in the following sections are intended to enable plant engineers, power plant technicians, sheet metal contractors or others to check and successfully field-balance any type of fan wheel for static and/or dynamic correction.

When preliminary checks have been completed and all corrective measures applied, the fan may still vibrate. In such cases, it is desirable to check wheel and flexible coupling balance (if direct-connected) or wheel and fan sheave balance (if belt-connected). Three separate balancing operations are available to meet field-balancing requirements: (1) balance with fan stopped, (2) balance with fan in operation and (3) dynamic two-plane balance.

Vibration encountered in direct-connected fans can sometimes be corrected by altering the position of the flexible coupling halves with relation to each other. Because of the simplicity of the method, it is advisable from a time-saving standpoint to check this possibility on direct-connected fans before undertaking a more complicated approach. Recommended procedures for each operation are presented separately in the following sections.

Balance With Fan Stopped

This balancing procedure is applicable only to fans with either ball or roller bearings. Break flexible couplings (if direct-connected) or remove belts (if belt-connected) and proceed as follows:

Assuming fan has been run-in and shaft revolves easily, turn wheel assembly slowly by hand. Let shaft come to rest and mark high point at 12 o'clock on wheel or sheave, Fig. 1. Repeat operation several times, turning wheel assembly both clockwise and counter-clockwise.

Select balance weight at random and clamp in position at average high point—12 o'clock—of wheel and sheave. Clamped-weight should be located on inside of wheel blade near back plate, wheel rim or shroud, Fig. 2.

Check correctness of weight by moving clamped weight point to 3 or 9 o'clock. If weight moves toward 6 o'clock, weight mass is too great and must be reduced; if weight moves toward 12 o'clock, weight mass is insufficient and must be increased. Cut and try until shaft remains stationary wherever it is stopped.

At this stage, the rotating assembly should be in reasonably good static balance. Check by operating fan. If not entirely satisfactory, move weight slightly to one side or the other of original location.

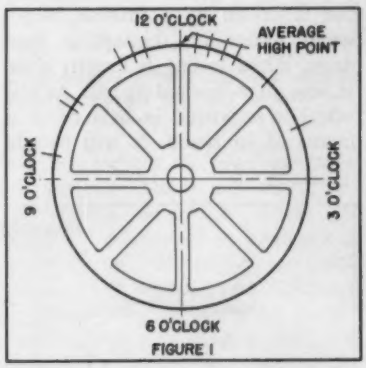
Balance With Fan In Operation

Clean shaft near bearings (preferably between bearing and wheel) with fine emery cloth. Bring fan up to speed and lightly touch cleaned area of shaft several times with yellow chalk or china marking pencil, being sure that hand is not supported on any portion of fan or other vibrating member. Locate average high point of markings and retain this point for future reference, Fig. 3. Attach an assumed weight at back plate exactly opposite this high point mark on the shaft, Fig 4. Again bring fan up to speed and remark shaft adjacent to original markings.

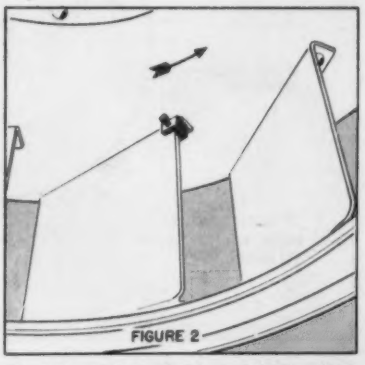
Carefully check first markings with second markings for the following:

1. If the mark is the same or has lengthened, it can be assumed that weight location is about correct but requires more mass.

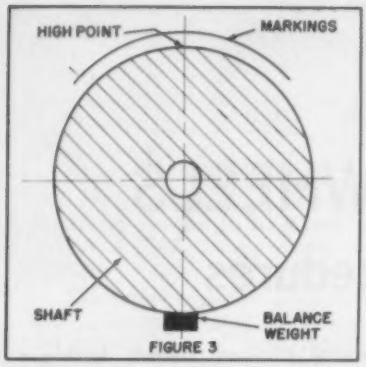
2. If mark has changed 180 degrees and is now in line with the weight, too much mass has been



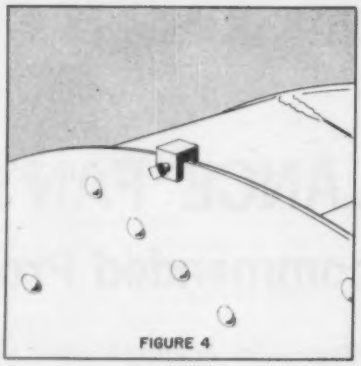
High points marked on wheel assembly permit good average to be established.



Centrifugal force holds weight in place. Arrow indicates direction of rotation.



Shaft markings give average high point for balancing with fan in operation.



Assumed weight is attached at back plate opposite the average high point.

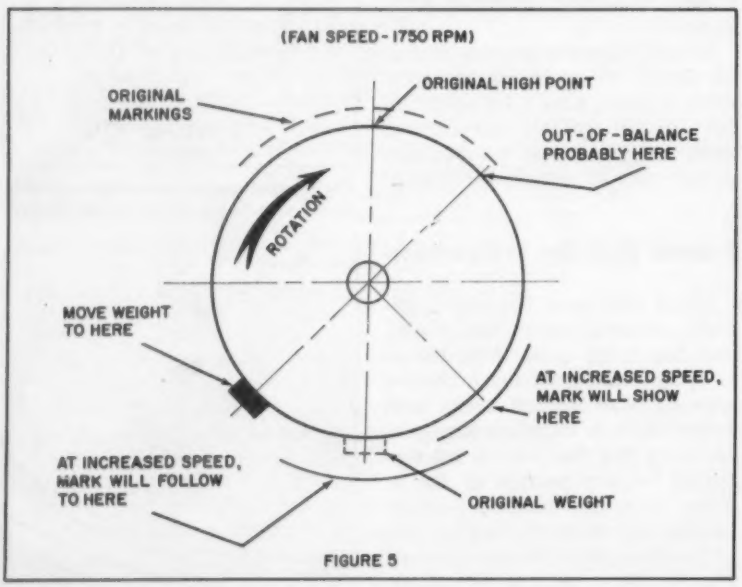
added and this should be reduced.

3. If marks have moved slightly and do not coincide with the original marks, weight is incorrectly spotted and should be advanced or retarded until marks are either in line with original marks or opposite original marks.

4. If marks go completely around the shaft, the fan wheel should be in reasonably good balance.

The foregoing procedure covers a simple one-plane balance. If the fan is driven by a turbine, multi-speed motor or through a fluid drive, initial testing is usually done at less than normal speed. As the wheel is improved in balance, it is increased in speed. It will be observed that as the speed is increased, the actual high point of the shaft will tend to lead ahead of the out-of-balance markings on the shaft, requiring a correction to the weight location. Move the weight toward the original high point and recheck. See Fig. 5.

If mark follows to second position (usually opposite of original), the weight is in the correct spot but heavy in mass. Removing some of the weight should make the mark stretch out until it finally goes completely around the shaft. Again, this covers a simple one-plane balancing procedure which is usually very effective on narrow wheels. On wider wheels, and sometimes on narrow wheels operating at high speeds, it is not uncommon to run into a force couple, which will require a two-plane balance as outlined in the following section.



Conditions indicated here will generally be found as speed increases. Weight must be moved from 6 o'clock to the spot indicated to achieve proper balance.

Dynamic Two-Plane Balance

Installations in which a force couple is produced require a two-plane procedure in balancing. The wheel is rotated and the shaft marked at points A-1 and A-2 as shown in Fig. 6. If the two marks are identical and in line on the same side of the shaft, the weight can be attached to the center plate, C, at a position 180 degrees from the high point, Fig. 7. If the marks are not in line, then each side of the wheel must be balanced individually.

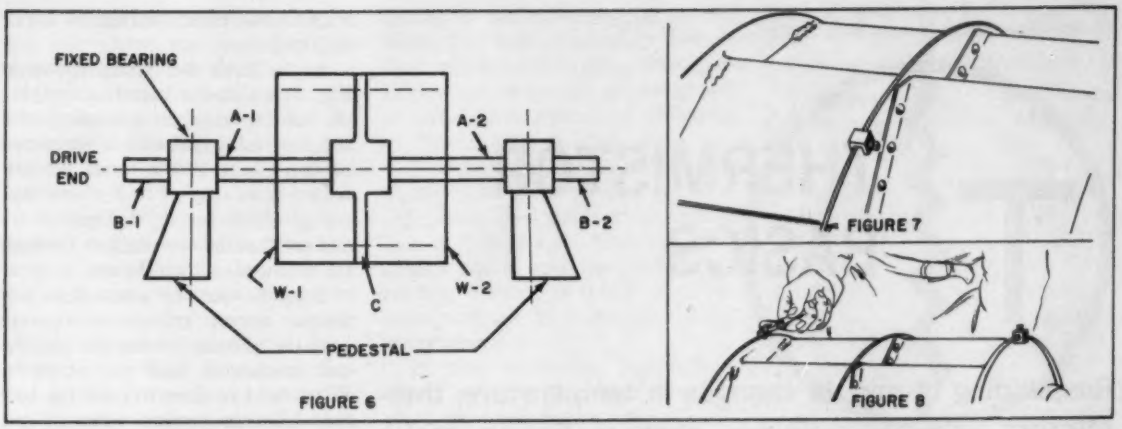
Usually one side of the wheel is more out of balance than the other. Balancing the worst side often reduces the work required to balance the other side. A good sense of feel or a vibration indicator will readily show which bearing is vibrating the most.

If both bearings appear to vibrate about the same from markings at A-1 and A-2, attach weights on each side of the wheel near outer ring at W-1, and W-2, Fig. 8, at a position 180 dgrees from the high point and balance independently of one another.

If exposed shaft at A-1 and A-2 is not accessible, mark shaft at points B-1 and B-2 (outside of bearings), then the markings on the shaft at B-1 will correspond with the wheel weight location at W-1 and marks at B-2 will coincide with the wheel weight at W-2. When balancing at B-1 and B-2 (outside of bearings), attach weights on each side of the wheel near outer ring at W-1 and W-2, at the high point, and not 180 degrees from high point as was done when using points A-1 and A-2.

Overhung Wheels

In the case of overhung single inlet wheels, the corresponding moments are as indicated in Fig. 9, where shaft marks A-1 and A-2 coincide with wheel weight locations at W-1 and W-2, respectively, and shaft marks B-1 and B-2 also coin-



In dynamic two-plane balance, marking shaft at A-1 and A-2 is preferred. If marks are identical and in line, weight can be attached at C. Otherwise the weights are applied at W-1 and W-2. In Fig. 7, weight is attached to the center plate. When balancing sides of double-width wheel independently, attach weights on each side near outer ring, Fig. 8.

cide with weight locations at W-1 and W-2.

On occasion, it will be observed that application of the aforementioned procedures may not correct the out-of-balance condition. The marks placed on the shaft may move to the right or to the left from the original with each relocation of the weights. The very fact that marks will not lengthen out or move 180 degrees from the initial point usually indicates that other prominent factors are contributing to the instability of the fan assembly. This unsatisfactory fan performance can frequently be traced to inadequate foundations, a bent shaft or a wheel with very bad runout. The latter is usually caused by damage in handling or stresses imposed by indiscriminate weldors during field operations.

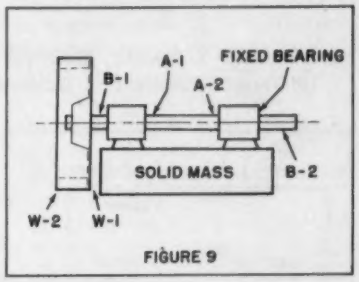
When any of these conditions exist, the alternative is to "cut and try." Select a spot on the wheel and clamp on an assumed weight. If the balance is not improved, try a point 180 degrees from the original spot, then 90 degrees forward and then 180 degrees backward until a location and weight mass is found that will improve vibration and out-of-balance conditions to a satisfactory and acceptable level.

If it appears that dynamic two-plane unbalanced conditions prevail, try locating two weights 180 degrees apart, one fastened to the back plate and the other to the outer ring, Fig. 10, following a blade sequence pattern, until the rotating members are brought into reasonable balance. Finish off by increasing or decreasing the weight mass.

Permanent Weight Attachment

All balance weights used in "cut-and-try" procedures must necessarily be temporary to permit removal and adjustment. Upon completion of the trial balance, carefully weigh the trial balance weight and weld the equivalent weight at the designated point, Fig. 11. If welding equipment is not available, a C-type clamp of the proper size can be used. It should be securely fastened to the inside of the fan blade at the designated point, and should be located so that centrifugal force will tend to hold it in place as shown in Fig. 2.

Following welding or permanent attachment of C-clamp balance weights, recheck the wheel assembly for balance. Minor adjustments to the welded weights to refine the balance can be made by hand-grinding if the weld deposit has too much mass or by welding on additional weight should the mass be insufficient. C-clamp weights can, of course, be easily increased or decreased. **End**



Trial weights at W-1 and W-2 coincide with marks A-1 and A-2 or B-1, B-2.

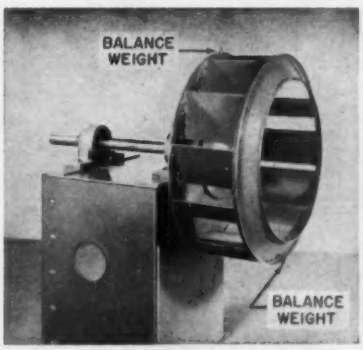


Fig. 10. Use two weights as shown on overhung wheel to correct unbalance.

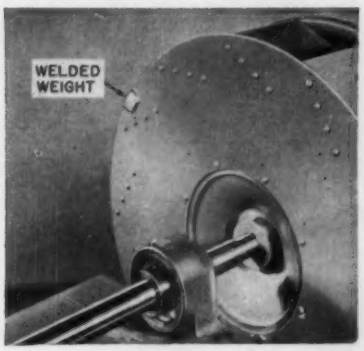


Fig. 11. Best method for affixing balance weight is by welding as shown.

THERMISTOR BASICS

Responding to minute changes in temperature, thermistors with their unique characteristics, make possible many extremely accurate temperature control devices. Here are helpful hints on how you can put them to work solving problems in your plant

By **HOWARD T. BAILEY, Electrical Engineer,**
Universal Foundry Co., Oshkosh, Wis.

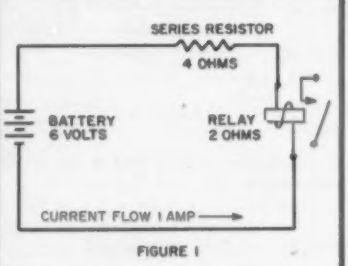


FIGURE 1

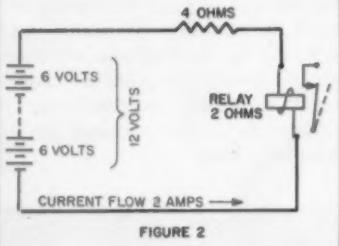


FIGURE 2

NUMEROUS ARTICLES have been published covering thermistor applications*; however, there have been very few explaining their basic characteristics in everyday language. The thermistor is a highly versatile control medium and plant engineers should have a workable understanding of their characteristics before they try in-plant applications.

How thermistors work depends entirely on where and how they are used. Even for those who have considerable knowledge of electricity, it may be wise to review some of the fundamental concepts which lead to successful thermistor applications.

In the basic d-c circuit shown in Fig. 1, we find a battery supplying six volts to a circuit consisting of a solenoid relay coil with a resistance of two ohms and a series resistor with a resistance of four ohms. Applying Ohms law to this circuit we can see that the current flow through the solenoid coil will be one ampere.

Suppose that the solenoid in this simple circuit refuses to operate until the current flowing through the coil reaches at least two amperes. What must be done to raise the current from its present value of one ampere to the required two amperes?

One method would be to increase the voltage. If we connected another six volt battery in series with the original six volt battery we would have a total of 12 v impressed on the circuit, Fig. 2. Again applying Ohms law, 12 v divided by six ohms results in a current flow of two amperes and the solenoid operates.

Another method is to reduce the resistance of the circuit, if this is possible. We could accomplish this by replacing the four ohm resistor with one of a lower value, say one ohm, Fig. 3. In this case, the total resistance of the circuit would then be three ohms. Six volts divided by three ohms results in a current flow of two amperes.

These examples show that we can prod our reluctant solenoid into operation by correctly adjusting either the voltage or the resistance of the circuit. We could accomplish the same result by modifying both the voltage and the resistance but this would double the work and add unnecessary complications.

Returning to the original relay circuit, Fig. 4 shows exactly the

*Five different industrial applications of the thermistor were shown in the article "Simple Thermistor Applications," that appeared in the November, 1958 issue, page 88.

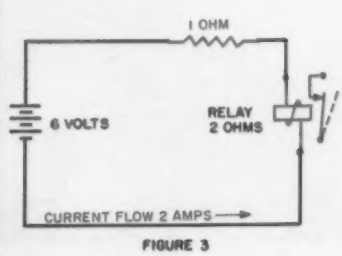


FIGURE 3

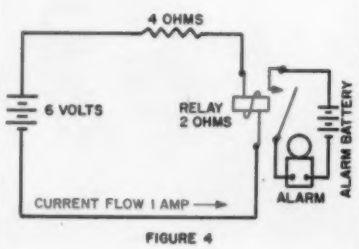


FIGURE 4

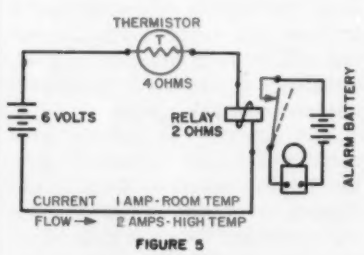


FIGURE 5

same circuit components as Fig. 1 but also shows the secondary circuit containing the alarm bell and its voltage source. In this form, the circuit is absolutely pointless. The resistance is too high, insufficient current flows and the relay cannot operate.

Assuming that additional batteries are not available, the only way to energize the relay is to reduce the series resistance from four ohms to one ohm with a suitable switch. Since this would be a manual job, it could be done more simply with less trouble and expense by including a simple on-off switch in the bell circuit.

Thermistor Controls Current

Imagine now that we have in our possession, a four ohm thermistor with a high negative temperature coefficient. In other words, when the temperatures rises, its resistance rapidly diminishes. If we place this in the circuit, Fig. 5, in place of the four ohm series resistor, we find the relay will operate whenever the temperature of the thermistor rises.

This is now a basic circuit that can be used as a fire-alarm, an automatic oil burner control or a freezer control. Any control function, responding to either a rise or fall in temperature, can be designed around this basic concept.

Circuit values used in these examples have been kept simple to assist in understanding how these circuits work. Actual values will be somewhat different and we can now proceed with the job of designing a temperature alarm using a 100,000 ohm thermistor.

In this circuit we will use a battery voltage of 135 v and a relay having a coil resistance of 10,000 ohms that will close when current flow reaches 0.003 amp. The thermistor and relay coil are connected in series so that the total resistance of the circuit is 110,000 ohms.

A quick check with Ohms law shows that 135 v divided by 110,000 ohms will result in a current flow of 0.0012 amp. Since the relay cannot pull in until the current flow reaches a value of 0.003 amp, the alarm will not be triggered at room temperature.

In this particular temperature alarm, we want the alarm to sound when the room temperature rises to approximately 60 C. This is 140 F and would be ample warning of overheating or fire. To determine whether or not the relay will be triggered at this temperature, we will have to know the resistance of the thermistor at this temperature.

Table I shows multipliers used to determine the resistance of this particular thermistor at various temperatures. We already know that the thermistor has a resistance of 100,000 ohms at 25 C. We can find the resistance at any temperature by applying the proper multiplier. For example, the resistance at zero C would be 100,000 times 3.274 or 327,400 ohms.

Finding Hot Resistance

We need the resistance of this particular thermistor at approximately 60 C. Scanning down the temperature column we stop at 60 C, looking over to the right we see the multiplier 0.2482. Multiplying 100,000 by 0.2482 we find that the resistance of the thermistor at 60 C will be 24,820 ohms.

Table I. Multipliers for finding thermistor resistance at other temperatures.

Degrees Centigrade	Resistance Multiplier
—60	145.2
—50	68.88
—40	34.28
—30	17.92
—20	9.792
—10	5.560
0	**3.274**
10	1.992
20	1.250
25	**1.000**
30	0.8053
40	0.5316
50	0.3595
60	**0.2482**

Using Ohms law again and substituting 24,820 ohms in place of the original value of 100,000 ohms we find we can readily calculate the current flow at the higher temperature. Adding the resistance of the relay coil, 10,000 ohms, to the resistance of the thermistor at 60 C, 24,820, we have a total circuit resistance of 34,820 ohms.

If we now take 135 v and divide it by this new resistance, 34,820 ohms, we will find a current flow of 0.0039 amp. From this it is evident that the relay will operate somewhat before the temperature reaches 60 C. This would cause no concern, however, because it provides the opportunity to introduce a variable resistor into the circuit. By adjusting the value of this variable resistor, Fig. 7, the relay can be made to trigger at exactly 60 C.

Sensitivity of this circuit is very high. The thermistor is almost eight times as sensitive as a resistance bulb and 400 times as sensitive as a precise thermocouple. **End.**

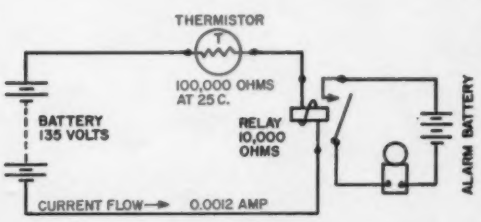


FIGURE 6

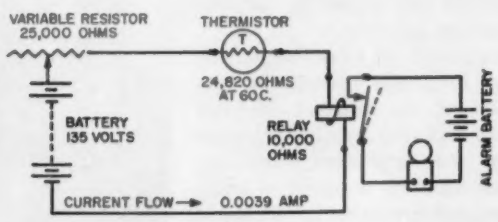


FIGURE 7

SCHOOL FOR USAF'S PLANT ENGINEERS

Special courses train them for many complex jobs

By DONALD L. MANG, Capt., USAF, Instructor, Civil Engineering Center
Air Force Institute of Technology, Wright-Patterson Air Force Base, Dayton, O.

THE DUTIES of an Air Force Civil Engineer are difficult to define but a reasonable analogy may be drawn between the civil engineer and the plant engineer of industry. Air force civil engineers and plant engineers are responsible for designing and building structures, utility systems, and other support facilities maintaining the plant to ensure its continued, economical operation.

At Wright-Patterson Air Force Base near Dayton, Ohio, the United States Air Force established the School of Installations Engineering. Its purpose was to train officers in Air Force engineering functions to fill the many vacancies caused by the withdrawal of the Corps of Engineer officers from the Air Force.

The work of the School has since been greatly expanded and it has been redesignated the Civil Engineering Center. (The term "civil engineering" may be misleading because it does not have the same connotation when applied to the Air Force career field as it does in civilian industry. Civil Engineering in the Air Force encompasses many of the engineering sciences and is not in any way limited to the civil engineering specialty.)

To this end, the Civil Engineering Center frequently revised the curriculum of the original 26-week course until the existing 37-week course was established. This advanced course is designed to equip officers with a working knowledge of many engineering sciences.

Plans are also being formulated for the establishment of a series of short courses which will enable the civil engineer to remain current in his specialty.

The existing curriculum of the advanced course is varied and includes information on the technique and practical application of many diversified fields of engineering, including: architectural, civil, electrical, general, industrial, mechanical, nuclear and sanitation. In addition to these technical subjects, approximately one-third of the course is devoted to subjects in the area of management.

In 1953 an additional requirement was recognized. A large number of engineering graduates were entering the Air Force from the ROTC program, and, while they possessed a good technical background, precious months were spent orienting them to Air Force procedures prior to becoming a productive officer. To alleviate this situation, a nine-week orientation program was established to prepare young engineers to perform effectively at the air base level.

A basic course of nine weeks' duration, designed to indoctrinate officers initially entering the Civil Engineer occupational field, embodies a study of Air Force policies, directives and procedures for the management of base engineering functions. The course is presented four times each year.

To fully exploit each student's maturity and experience, formal

Fig. 1. Instructor uses working model showing phases of refrigeration cycle.

9-WEEK BASIC COURSE

SUBJECT	CLASS HOURS
Base Engineer Functions	31
Supervisory Management	21
Real Estate Admin.	17
Fiscal Budgeting	14
Maintenance Management and Control	39
Engineering Contracts	13
Operations and Maintenance Programming	24
Installation Planning, Military Construct.	24
Arctic Orientation and Construct. Techniques	3
Nuclear Effects and Recovery Planning	20
Security Indoctrin.	2
Comprehensive Problem	29

37-WEEK ADVANCED COURSE

SUBJECT	CLASS HOURS
College Algebra	32
College Physics	32
Hydraulics	32
Elementary Soil Mechanics	48
Heat Power	64
Airport Planning	28
Executive Eng. I	70
Executive Eng. II	70
Architectural Eng. I	45
Architectural Eng. II	45
Principles of Management	36
Speech and Conference Leadership	48
Personnel Management	42
Industrial Eng.	36
Industrial Electricity	50
Water Supply and Waste Disposal	50
Pavement Technology	48
Nuclear Weapons Effects	48
Nuclear Weapons Effects Laboratory	24
Construction Eng.	48
Heating and Air Conditioning	48
Special Lectures	24
Field Trip	42
Total	1010

classroom lectures are supplemented by group discussions, seminars, and problem solving exercises. Group discussions and seminars have proved extremely valuable tools of instruction. At the present time, approximately 40 per cent of the basic program and 15 per cent of the advanced program is devoted to the group discussion and the seminar method of presentation.

Because the Center feels that it promotes better individual understanding and enables the student to benefit directly from the experience of an individual instructor, more and more emphasis will be placed upon these methods in the future.

Problem solving exercises are designed to enable the student to put into practice much of the material that is presented in the classroom. The problems are purposely made as realistic as possible; however, compensations must be made to meet the classroom situation.

In the basic course, the comprehensive problem exercise was made completely realistic and resulted in so much frustration to the student that the degree of learning was seriously hampered. Authenticity was then tempered with student frustration to produce an uncomplicated, realistic exercise which effectively contributes to the desired learning outcomes.

Faced with the problem of maintaining increasingly complex plants with fewer budget dollars, Air Force Engineers are quick to recognize the value of sound management, technical proficiency, and the benefits which may be derived from a knowledge of the latest types of equipment. Management and technical subjects are presented in the classroom, and through the media of field trips and plant visits, the Civil Engineer students are acquainted with the most recent equipment advancements.

Frequent trips are scheduled to industrial plants, equipment manufacturers, construction firms, and to other Air Force bases. Such visits serve the dual purpose of introducing the students to civilian methods of accomplishing maintenance and, more important, serve to acquaint them with the latest equipment used in industry.

Many of the sophisticated problems facing the Air Force today were first met and solved by American industry and it is therefore only natural that the school should turn to industry for assistance in presenting solutions to these problem areas.

Field trips are scheduled on the

(Continued on page 202)

Fig. 2. Soil compaction experiment employs compaction hammer, scales, oven.

YOU CAN CUT LIGHTING COSTS TOO MUCH!

Pressing too hard to reduce initial costs can result in less light, more frequent lamp and ballast replacements and increased power costs

By C. M. HOLDEN, Commercial Engineering Dept., Champion Lamp Works, Lynn, Mass.

MOST PLANT ENGINEERS have been asked at one time or another to cut initial costs of proposed lighting installations. A big question that is seldom answered in later years is "Did the company really save any money?"

Obviously, initial costs are important and every effort should be made to design and install a lighting system that will provide comfortable illumination at low cost. However, placing undue emphasis on initial costs alone to the detriment of operating and maintenance costs can and does increase the total cost of light.

Just how important are initial costs? Based on a life of 10 years, Fig. 1, cost of the initial lamps and fixtures for a typical fluorescent installation amounts to a little more than 25 per cent of the total cost of light. With a life expectancy of 20 years, this figure drops to 15.5 per cent.

You can readily tell which figure to use. If you have an approved budget to replace lighting installed as recently as 1950, then use the 10 year figure. If the installations you are presently modernizing are much older, use the 20 year graph.

In both cases, power costs amount to around 50 per cent of the total cost of light. On this basis, efficiency of the system should be twice as important as initial costs. Even fixture cleaning accounts for a healthy 10 per cent of the total cost and equipment that is easy to keep clean should rate high on your fixture preferences.

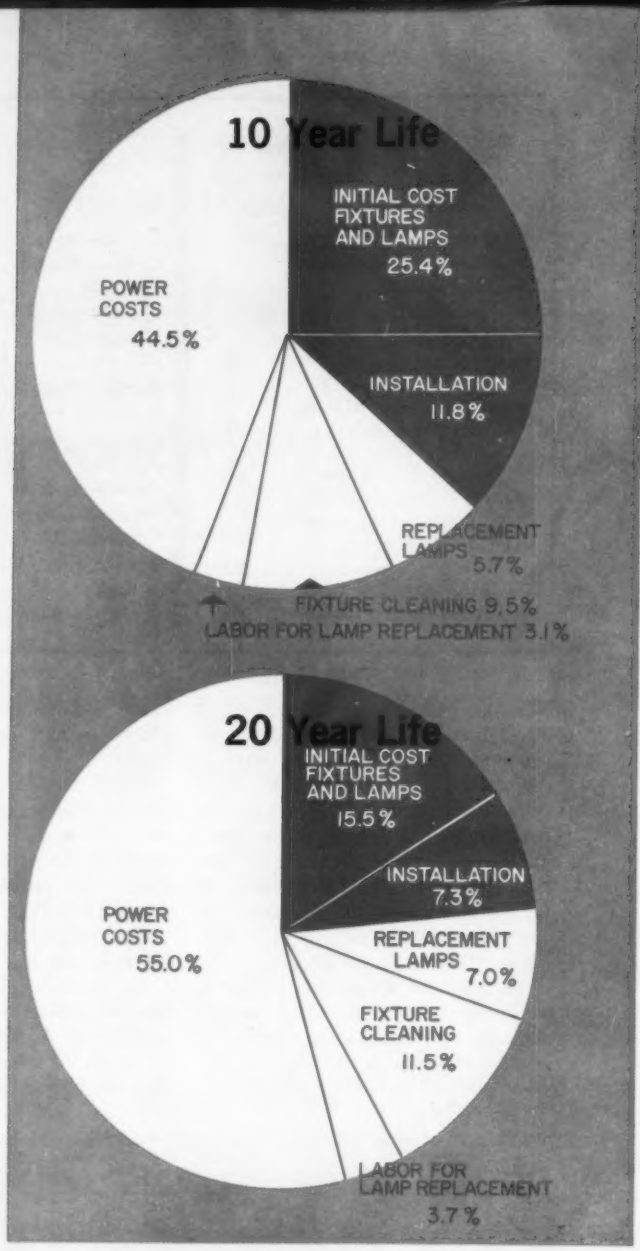


Fig. 1. Distribution of costs for a typical lighting system shows the relatively small part played by initial costs.

When you press too hard to reduce fixture costs you may find that higher maintenance costs in later years will more than offset a small initial savings. There are many ways a fixture supplier can meet the price conditions demanded by purchasers interested only in cost.

As far as fluorescent lighting is concerned, the ballast offers the largest single cost item in the fixture and it is here, very often, that the cost savings demanded are made. There are many ways in which a ballast can be made to meet price conditions. Iron of poor quality may be used in the laminations and will result in higher ballast losses, excessive heating and an increase in the noise level of the ballast.

Skimping on wire can mean higher temperatures within the ballast which cause early ballast failures, increased maintenance and replacement costs. Insufficient insulation on ballast wiring results in arc-overs and premature ballast failures.

Style trends, along with price demands, have forced the lighting industry into a problem of ballast heating. Normally, the fixture plays a great part as a radiator to dissipate heat losses that are prevalent in the ballast housing. New style trends with small cross-section area fixtures together with more heavily loaded lamps and restricted mounting conditions, Fig. 2, have resulted in a number of cases where high temperature surrounding the ballasts have caused premature failures of these rather expensive components.

Normal maximum temperature of the ballast case is usually 90 C. If poor ventilation or other conditions allow the case temperature to exceed this value by 10 C over its maximum, ballast life will be reduced by approximately 50 per cent. An additional 50 per cent is lost for each succeeding 10 C rise in the ballast case temperature. Here, again, it is necessary to look at the over-all picture to be sure that the proper fixture type is utilized and a ballast that will withstand possible severe conditions is employed. Naturally, these conditions may cost a little more initially but savings will be enjoyed due to a drastic reduction in maintenance labor and inconvenience costs.

How does a ballast fail from excessive temperatures? Essentially, what happens is that the potting compound, used to dissipate heat from the component parts that go to make up a fluorescent ballast, becomes brittle and loses some of its heat conducting properties. This causes the ballast components to operate at excessively high temperatures. Insulation over coils becomes dry and brittle and eventually, short circuits result which damage capacitors and cause a melting of the potting compound. Oil and a tar-like substance then ooze from the ballast possibly damaging equipment located beneath the fixture and, at the same time, destroying two normally good lamps as they fail.

Lowering quality standards is another way to reduce ballast costs. This usually results in many early failures and poor control over the electrical supply to the lamp. This last item is a much more difficult one to track down but it results in poor lamp efficiency, premature blackening and more frequent lamp replacements.

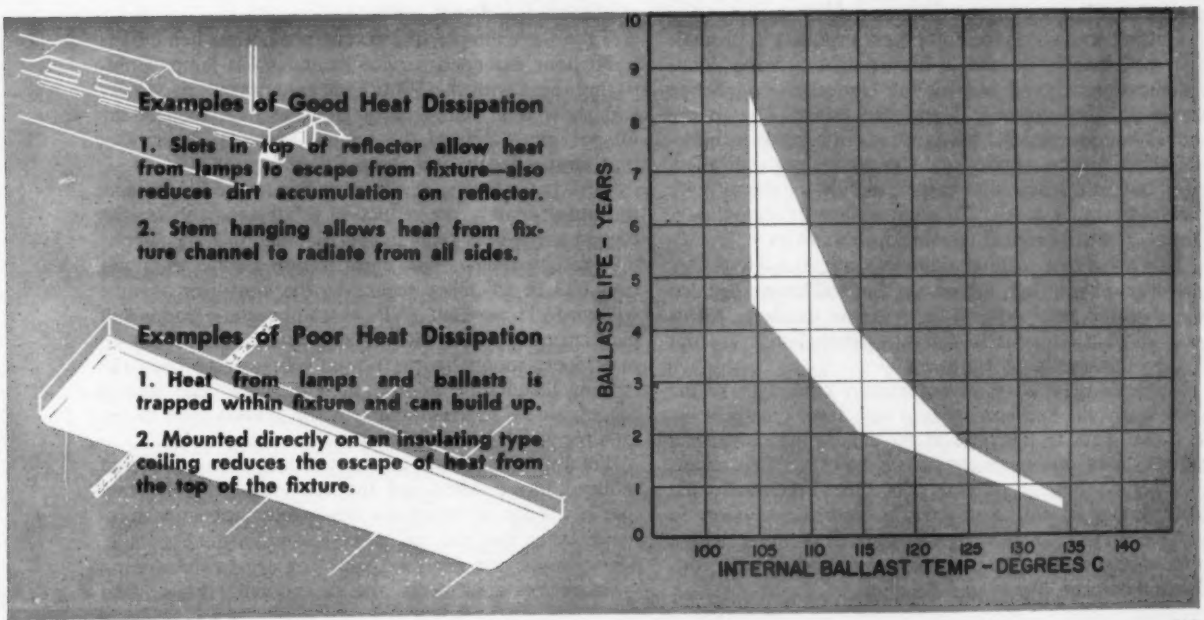
Certified Components Pay Off

There have been a number of agencies set up to assist the user in getting more for his money. The Certified Ballast Manufacturers group through the Electrical Testing Laboratories helps the user get a ballast that will provide proper electrical control over the lamp and assure normal lamp operation. Certification by this agency will minimize those difficulties where, due to low ballast output, foot-candle levels are way below the calculated intensity. Ballast heating will also be minimized since this also is tested.

Non-certified ballast equipment has been recently checked and found to reduce lamp life from 13 per cent to 50 per cent, Fig. 3. Lamp currents, which are normally specified by the manufacturers, have been found to be reduced from 12 to 50 per cent. All of this means that maintenance calls to replace burned out lamps will increase when this equipment is used while, at the same time, the user is getting less light from the lamps. In effect, he is wasting a large proportion of the money he spends on the fixtures and the power he pays to operate them in his installation.

Even fixture construction may be altered to save part of the initial purchase dollar. Finishes that deteriorate

Fig. 2. Ballast life is roughly proportional to the temperature at which it is operated. Modern fixture designs tend to result in higher ballast temperatures.



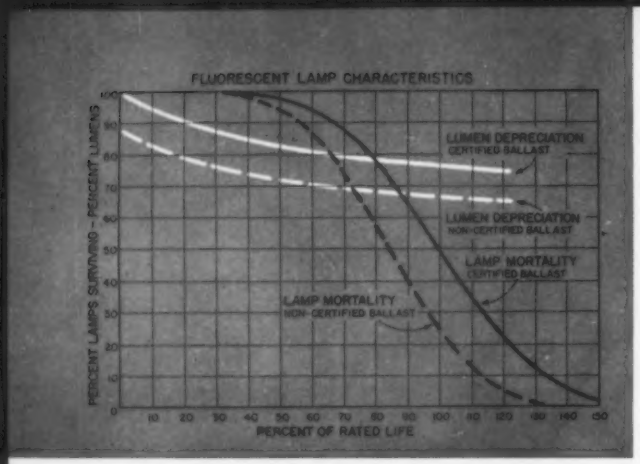

FLUORESCENT LAMP CHARACTERISTICS
PERCENT LAMPS SURVIVING - PERCENT LUMENS
LUMEN DEPRECIATION CERTIFIED BALLAST
LUMEN DEPRECIATION NON-CERTIFIED BALLAST
LAMP MORTALITY CERTIFIED BALLAST
LAMP MORTALITY NON-CERTIFIED BALLAST
PERCENT OF RATED LIFE

Fig. 3. Designing ballasts to meet a low price can result in less light per fixture and more frequent lamp replacements.

rapidly, or will not return to their original luster when cleaned, can be applied. Movable parts that do not fit accurately or won't stand up under normal maintenance, all mean to the consumer that he will undoubtedly pay much more in additional maintenance service cost than he saved in the initial price deal.

RLM fixture specifications cover a wide variety of good quality aspects that are required in the fixture itself to give the user long service at high efficiency with a minimum of maintenance difficulties normally encountered with fixtures built to low price standards. Materials, finishes, design, performance and component parts all must meet high standards in order to carry the familiar RLM label.

The Underwriters' Laboratories label will not assure maintenance-free operation. This agency is set up to check only the electrical and fire safe design of the fixture and components that go in it and gives no indications of its ability to stand up or control the lamp properly. Fluorescent lamps operated on U.L. tested equipment do not necessarily produce their rated light output and provide normal rated life. The security offered by this label can still mean higher maintenance costs.

Cutting corners on the equipment installed to produce light will invariably lead to higher lighting costs. Your specifications should call for the Underwriters label to insure adequate electrical and fire safety. The fixture should comply with RLM standards in regards to materials used, finishes applied and component parts installed. Last but not least, the ballast should conform with standards set up by the Certified Ballast Manufacturers group of the Electrical Testing Laboratories.

There are many things you can do in the day-to-day operation of your lighting system that will have a decided effect on the total cost of light. As an example, let us look at what happens in a fixture when lamps are not changed promptly on burn-out.

Unfortunately, lamp manufacturers cannot make the cathodes of the fluorescent lamp with sufficient accuracy to cause them to both fail at the same time and like a pair of shoes, one wears out before the other. This means that when a fluorescent lamp fails, there is generally one cathode that is still functioning in a normal manner. In certain circuits, such as instant start or slimline, where high voltages exist, the lamp may act as a rectifier, conducting current in only one direction.

When this takes place, the entire circuit changes from alternating current to pulsating direct current. The internal construction of the ballast requires alternating current to properly limit the current through the lamp to its proper value. A pulsating direct current naturally destroys this current limiting property and a lamp which normally has current limited to slightly under one-half ampere may find a sudden current increase to approximately 2½ times that value.

Excessive current through the lamp occasionally causes failures in the cathode which may rupture the glass tubing. This may take eight to ten hours to accomplish before final complete failure but of more concern to the maintenance department is the fact that it may reduce ballast life by approximately 10 per cent. The capacitor side of the same ballast will continue to function as an a-c circuit and occasional failures may take place but without too much damage to the ballast.

In many series type circuits the de-activation period may extend well over 200 hours. If the lamp is allowed to continue to complete failure in this condition, ballast life may be reduced by approximately 50 per cent.

Most of you are well aware that it costs a lot less to replace a burned out lamp than it does to replace a burned out ballast. Labor charges ranging from $12.00 to $25.00 to replace a burned out ballast have been noted. Add to this figure the 50 per cent waste of ballast cost and a comparison of the losses entailed by leaving deactivated lamps in the fixtures can be made.

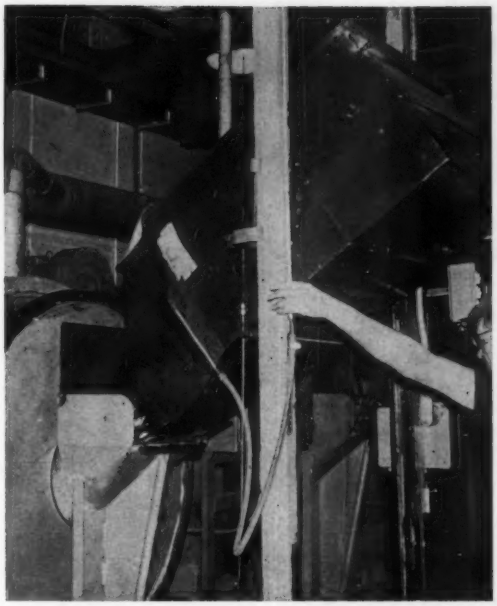
Long Life Lamps

As far as lamps themselves are concerned, there are factors of long life, peculiar colors, guarantees, and many other facets that salesmen stress when talking to the user. Long life has been a big sales tool for incandescent lamps and special emphasis has been placed on the maintenance labor savings that are evolved by the use of these lamps. Unfortunately, as far as incandescent lamps are concerned, the customer has his choice of long life or high efficiency. He cannot get both.

Take for example, the recent promotion behind the 2500 hour extended service incandescent lamp. Comparing these with the 1000 hour general service variety will show that maintenance labor will be reduced by 60 per cent. Behind the screen, however, is the fact that lamp efficiency is down 16 per cent.

With these figures this sounds like a good exchange, but unfortunately the reduction in efficiency effects the biggest single cost items in your lighting budget; namely, light received, power and amortization costs. The 16 per cent loss in efficiency means to the consumer that he will waste 16 per cent of the cost to purchase and install his fixtures together with 16 per cent of the money he pays every month to the power company to keep the lighting installation going. All of this financial loss is accompanied by a reduction in the illumination in the area for which he originally purchased the fixture.

Total up these losses in amortization, power cost, and reduced foot-candles and the user will generally find that it will far outweigh the slight reduction in maintenance labor that the use of these lamps would provide. These lamps are designed only for areas where lamp replacement labor costs are exceptionally high. **End**



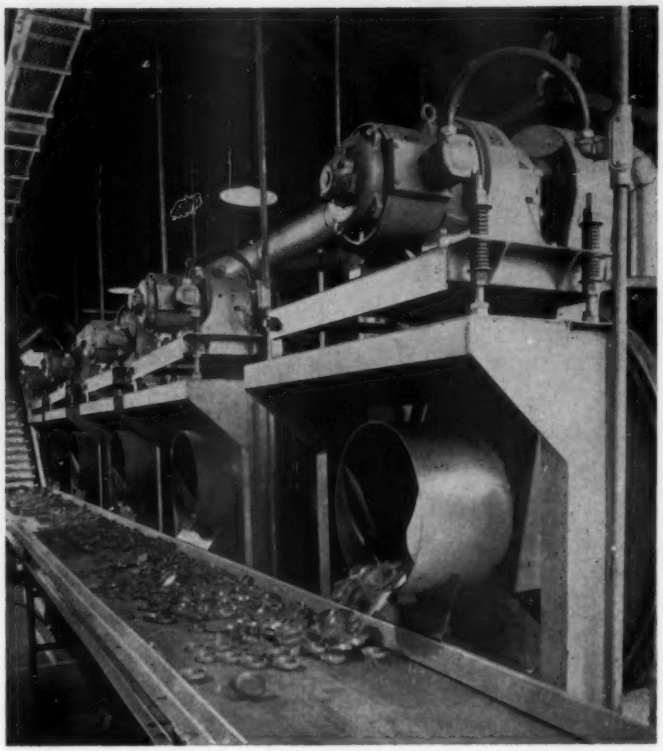


Fig. 1, above. Barrels of plastic caps are hoisted by overhead traveling crane into tumbler. Fig. 2, right. At the end of cycle caps are discharged onto moving belt on opposite side. Scanning device prevents tumblers from discharging concurrently, which avoids mixing different caps.

DUST-FREE HANDLING—

Small parts automatically tumbled, washed and dried

AUTOMATIC TUMBLING and washing is providing dust-free molded plastic closures and a cleaner working area at the Armstrong Cork Company's Packaging Materials Plant at Lancaster, Pa.

The new system removes dust and flashing from closures more efficiently, eliminates manual lifting, and provides a cleaner working area than was formerly possible.

A traveling overhead crane hoists barrels of molded closures and carries them to one of a row of five automatic tumblers. The barrels are tilted so that the closures fall into a center hole in the tumbler. An operator sets a timing device on the tumbler to stop it at the end of the desired cycle.

Flashing and sharp edges are rubbed off the closures during the tumbling and the dust and particles are drawn off by suction to a large dust collector outside the building. The dust falls into metal bins which are removed by hoist truck and carried to a dumping area.

Both ends of the tumbler are open—one opening for loading, the other for unloading. All the tumblers unload onto a moving belt which carries the closures to a washing operation.

An electronic system that scans the tumblers in sequence prevents any tumbler from dumping until another tumbler has already ejected its load onto the belt. This prevents mixing different closures.

After the closures pass through the tumblers, they are carried on a conveyor belt to the cap washing machine, a perforated drum 25 ft long and 4 ft in diameter.

They are immersed in a water soak wash propelled by a long spiral, then carried to a rinse wash and moved on to a drain. From there, they go to another rinse, are drained, and passed on to a large drum where they are dried by blasts of hot air.

The closures continue on a conveyor belt past an inspection point, and are then placed in cartons and sent to a warehouse.

Under the old system, the barrels of closures coming from the molding machines were dumped by hand into horizontal rotating wire mesh barrels and tumbled with wet chamois cloths. **End**

Fig. 1. After priming with cement-based paint, water-thinned acrylic emulsion paint was applied to cinder block wall.

LATEX PAINTS GO OUTDOORS
Brush, Roll or Spray Them

By GEROULD ALLYN, Rohm & Haas Company, Philadelphia, Pennsylvania

RISE IN THE use of latex paints is one of the most interesting developments in the annals of the paint industry. In the short span of about ten years these water-thinned emulsion paints have climbed steadily in volume of use.

The rise of latex paint has been characterized by growth into successive new areas of application. Introduced as coatings for interior plaster and cinder block walls, these paints initially gained popularity among amateur wielders of brush, roller, and hand spray. The do-it-yourself market was the first area into which they moved.

Next, these remarkable newcomers to the coatings world moved outdoors; and the latest area which they have invaded with marked success is the field of exterior masonry.

One of the chief destructive forces on masonry is moisture. Most untreated out-of-doors masonry surfaces absorb considerable quantities of water from rainfall and dew. This leads to various forms of deterioration. The dampness itself is, of course, undesirable in any structure, and may lead to the formation of mildew and mold on exterior and interior walls, particularly in warm, damp climates.

When moisture freezes in a masonry wall, it causes spalling and gradual disintegration of the surface. Ice exerts tremendous pressure within the structure. The result is the breaking away of pieces of masonry and the opening of joints and cracks. These fissures permit more water to penetrate the structure, causing further damage.

Another problem is efflorescence

—a deposit of soluble salts on the masonry. This, too, results from moisture penetration. The moisture brings soluble salts in the masonry to or near the surface. These salts are present in nearly all masonry. They consist largely of sodium, potassium, calcium, magnesium and aluminum salts. Deposited on the masonry surface, they leave an unsightly white stain; or they may crystallize just beneath the surface to cause cracking and spalling.

Dampness Damage

Paint is the most common form of treatment to reduce the moisture intake of masonry surfaces, and thereby reduce the damage dampness causes. At the same time paint protects these surfaces from the effects of corrosive atmosphere and sunlight.

There are a number of different types of paint made especially for use on outdoor masonry. Paint manufacturers provide two-coat and three-coat systems. One good three-coat system includes a penetrator, base coat and top coat for all types of masonry surfaces.

It is important that the recommendations of the paint manufacturers be followed closely, particularly with regard to thinning, spreading rate and conditions of application; because all paints are not alike, and there is a wide variation in surface conditions.

In considering the various types of masonry paint available today, it is well to keep in mind that each has its advantages.

The distinguishing feature of latex emulsion paints is the fact that they are thinned with water rather than with painter's naphtha or other flammable solvent. As coatings for exterior masonry, the various types of these paints have in common some interesting and worthwhile properties. They also have limitations which must be understood if paint failures are to be avoided and satisfactory painting results obtained.

These water-thinned paints are extremely easy to apply by brush, roller coater or spray gun. Cleanup, too, is easy for the simple reason that soapy water can be used. These two properties by themselves probably account for the quick acceptance of these paints by consumers, particularly those in the do-it-yourself category, when these paints first appeared on the market some ten years ago.

Latex paints dry quickly, they have very little odor and they present no fire hazard from flammable solvents. The three major types of latex paint being used in large volume on exterior masonry today are: butadiene-styrene, vinyl and acrylic. In addition, there are two specialized types in limited use: alkyd emulsions and multicolor lacquers.

Another big advantage which latex paints have in common is that they can be applied to damp masonry surfaces. This means that painting can be started very soon after rain or on walls still wet with morning dew.

As a group, the latex paints have good chemical resistance to fresh stucco, concrete and mortar. Consequently, it is not necessary to allow masonry structures to age before painting, nor is it necessary to use a neutralizing wash. All three types mentioned show good permeability to moisture vapor, thus permitting moisture trapped in a wall to escape slowly without blistering the paint.

Proper surface preparation is important before applying latex paints, because they will not penetrate a loose, chalky surface to any significant degree. Where this surface condition is encountered, sandblasting or the use of a surface conditioner is essential.

Water-Thinned Paints

The butadiene-styrene, or rubber-based latex paints, as they commonly are called, were the first of the three major new types of water-thinned paints to be introduced in volume following World War II. They were made from a new synthetic rubber latex which became available through the termination of the Government's wartime synthetic rubber program. They were developed first as interior paints, but subsequent research has extended their use into the field of exterior masonry. In this application, they are easy to apply, they dry quickly, and have a minimum of odor. Their resistance to alkali is outstanding.

As to water resistance, however, they develop it somewhat less rapidly than the vinyl or acrylic types .This means caution must be used in recoating them in the first few hours after application of the initial coat. They are most satisfactory in white and in light tints, because their chalking rate may be somewhat too fast in deep colors for best appearance over prolonged exposure.

Vinyl Emulsion Paints

The next latex paints for exterior masonry to be introduced in the United States were the polyvinyl acetate emulsion group. As a group, they dry faster and permit recoating after a shorter interval than the butadiene-styrene family. In fact, their first large scale use was as a sealer for cinder block, stucco and plaster walls, since they can be recoated with water or oil paints in two to three hours after the first coat is applied.

These vinyl emulsion paints give improved color retention and a more uniform lower sheen compared to the butadiene-styrene coatings. Many paint manufacturers produce them, and they give good results on exterior masonry. Their cost is about the same as the butadiene-styrene materials.

Acrylic emulsion paints are the latest of the three major types to be used for exterior masonry. These paints use an emulsified acrylic polymer as a binder, which dries to form a tough, flexible and highly adhesive film that is a chemical cousin to the familiar acrylic plastic, Plexiglas.

Acrylic emulsion paints offer an impressive combination of advantages. Their color retention is excellent, and they have superior resistance to alkali, to scrubbing and to water spotting in damp climates. They can be recoated in thirty minutes or less, permitting a section to be painted with a single setting of the scaffold.

The acrylic latex used in these paints has excellent retention of flexibility on aging, as well as marked resistance to ultraviolet light. Some acrylic latex paint jobs on exterior masonry are now five and one-half years old and still are giving first rate appearance and sur-

Fig. 2. Three years after silicone water repellent application, wall on right looks clean; efflorescence appears on areas that were not treated with repellent.

face protection. Like butadiene-styrene and polyvinyl acetate emulsion paints, acrylic paints brush easily and can be applied to damp surfaces. With all three types, cleanup of brushes, rollers and spray guns with water is easy.

Recently acrylic emulsion paints have found an application of unusual interest. In light colors they have proved useful on cement tile roofs in areas of the South as coatings that reflect heat. In this application they not only give attractive appearance but also lower interior temperatures and reduce air-conditioning loads.

Alkyd Emulsion Paints

Alkyd emulsion paints which are related to the conventional alkyd types, also are being used successfully on masonry. Since they are in emulsion form, however, they may be thinned with water instead of solvent type thinners. They are easier to apply than the alkyd solvent types and have the advantages of reduced fire hazard and easy cleanup with water.

They show somewhat better penetration than the butadiene-styrene and related latex types and therefore give better adhesion on chalky surfaces. On the debit side, they are rather slow in drying, have more odor and do not offer as good alkali resistance and color retention as the latex types.

Still another new type of water-thinned coatings is available. They are known as multicolor lacquers and consist of a base color containing tiny droplets in contrasting hues. In the dried film these droplets appear as separate particles or dots to form a pleasing "polka dot" pattern which will cover many surface defects and irregularities.

A base coat must be used on a masonry surface before the multicolor lacquer is applied. Both polyvinyl acetate and acrylic emulsion paints are being used satisfactorily as the base coat.

A development in exterior masonry coatings is the application of silicone water repellents to bare masonry surfaces. See Fig. 2. These water repellents may be used on concrete, brick, cinder block and stone. First it is necessary to fill cracks and repoint masonry; otherwise the silicones will not keep water out. Rough cinder block should receive a coat of cement-based paint before the silicone water repellents are applied.

These water repellents consist of clear solutions which are applied by low pressure spraying or by flooding the surface. The solution penetrates the masonry surface often as deep as ¼ in. and provides a non-wetting surface that is highly repellent to water. There is no change in the surface appearance of the masonry after this treatment.

The treatment reduces frost damage as well as leaching of soluble salts, which cause efflorescence and spalling, since soluble salts cannot be carried to the surface when water is not present. The durability of silicone water repellents is good even though the layer they form on the outer surface of the masonry soon weathers away.

Where heavy rainfall creates conditions of extreme moisture, as in certain areas of the Pacific Northwest, coatings of asphalt often are used on exterior masonry walls. These coatings may be applied in either emulsion or solution form. Relatively thick, these coatings give extremely effective waterproofing of a masonry structure even on very porous surfaces. Since such coatings are black, they often are painted another color for attractive appearance as well as to reduce oxidation and cracking of the asphalt surface.

Cement-based paints are a group of coatings which have been used for many years on masonry surfaces. Basically, they consist of cement, lime and white or colored pigments, with sand sometimes added. These coatings must be used on bare masonry or over previous coats of similar cement paints, since they have little adhesion to masonry which has been coated with other types of paint.

Solvent-Thinned Paints

A large class of masonry coatings comprising a number of different types is known as solvent-thinned paint. The major types in this group are oil-based, alkyd, synthetic rubber, chlorinated rubber and epoxy paints.

Oil-based masonry paints have been used for many years and give excellent service. Alkyd paints are rather similar to the oil-based paints in their general characteristics. Often they are formulated to give less penetration, which may mean better color uniformity on porous surfaces. In general they are somewhat harder to brush than the oil-base paints, but they dry faster and give harder films.

Synthetic rubber and chlorinated rubber solutions give very good masonry paints which have excellent penetration and adhesion to previously painted surfaces which are moderately chalky as well as to new surfaces. The epoxy coatings are a new class of masonry coatings which is just coming into general use. As a group they have excellent resistance to chemicals and fumes.

They may be used over fresh

alkaline masonry surfaces provided the surfaces are dry. They appear particularly promising for severe service applications such as finishes on cinder block for gasoline filling stations. Their limitations include rather fast chalking rates on outdoor exposure.

Surface Preparation

Proper preparation of the surface is of paramount importance to the success of any paint job and this is especially true of exterior masonry surfaces. Even paints of the finest quality, applied by the most meticulous craftsman, will fail prematurely unless the surface has been inspected carefully and properly prepared prior to painting. Without this preparation, peeling and blistering of the paint are likely to occur soon after the job is finished. Such results are not only unsightly, but very expensive to correct.

If serious paint failure has occurred on a structure, it is important, first, to inspect the structure to make sure the construction does not permit the entry of large quantities of water. Defects to watch for, in particular, are inadequate flashing and the presence of cracks or other breaks or openings in the structure.

The preparation of masonry surfaces varies in method depending on whether they have been painted previously or not. For best results each of the major types of unpainted masonry surfaces requires slightly different preparation for painting.

On new or previously unpainted stucco, concrete or stone, cracks and holes should be patched with care, and the patches allowed to dry. Newly poured concrete may have an oily surface from oil or wax type curing compounds. This oil or wax must be removed by sandblasting, or by allowing it to weather away by delaying the painting for several months. If oil or wax remains on the surface when paint is applied, it may cause early blistering and peeling.

The surface of unpainted aggregate and cinder block is usually somewhat porous. One method of preparing these surfaces for painting is to fill the cracks and then apply a coat of cement-based paint which should be worked into the porous surface with a stiff bristle brush. This treatment gives a smooth dense surface which then may be painted readily enough. Some paint manufacturers make a special penetrating primer for such porous surfaces. Others recommend a coat of the same paint that is to be used for the top coat.

For surfaces of brick, repointing with mortar is often necessary. The mortar should be allowed to dry thoroughly before paint is applied. Asbestos cement shingles may be painted without special preparatory treatment, provided they are clean and the surface is hard. However, newly laid shingles of this type may have a high glaze which could present adhesion problems and should be allowed to weather for a few months before painting. If they are old, heavily eroded or very porous, their surfaces should be washed with water.

Some painters have found that the application of a concrete hardener such as magnesium fluorosilicate solution helps to provide a suitable base for paints on badly eroded asbestos cement shingles. After shingles are dry, a penetrating type surface conditioner may be applied to strengthen or "tone up" the old surface before painting starts.

Fig. 3. A brush with stiff bristles is preferred for sizing and waterproofing masonry foundation walls like this one.

Proper preparation of the surface is particularly important if the masonry has been painted previously. If the old coatings are sound, showing no peeling or blistering, and have only slight surface chalk, they may be repainted readily after cracks and breaks have been repaired. However, if the surface is chalking heavily or shows extensive flaking and peeling, then the safest procedure is to remove the old coating completely by sandblasting. This provides a firm surface to which paint will adhere.

Some paint makers produce surface conditioners of a penetrating type, which have been used quite successfully on chalky surfaces. These conditioners penetrate the chalked layer of paint, strengthening it and binding it to the underlying masonry. They require several days for drying before top coats of paint can be applied.

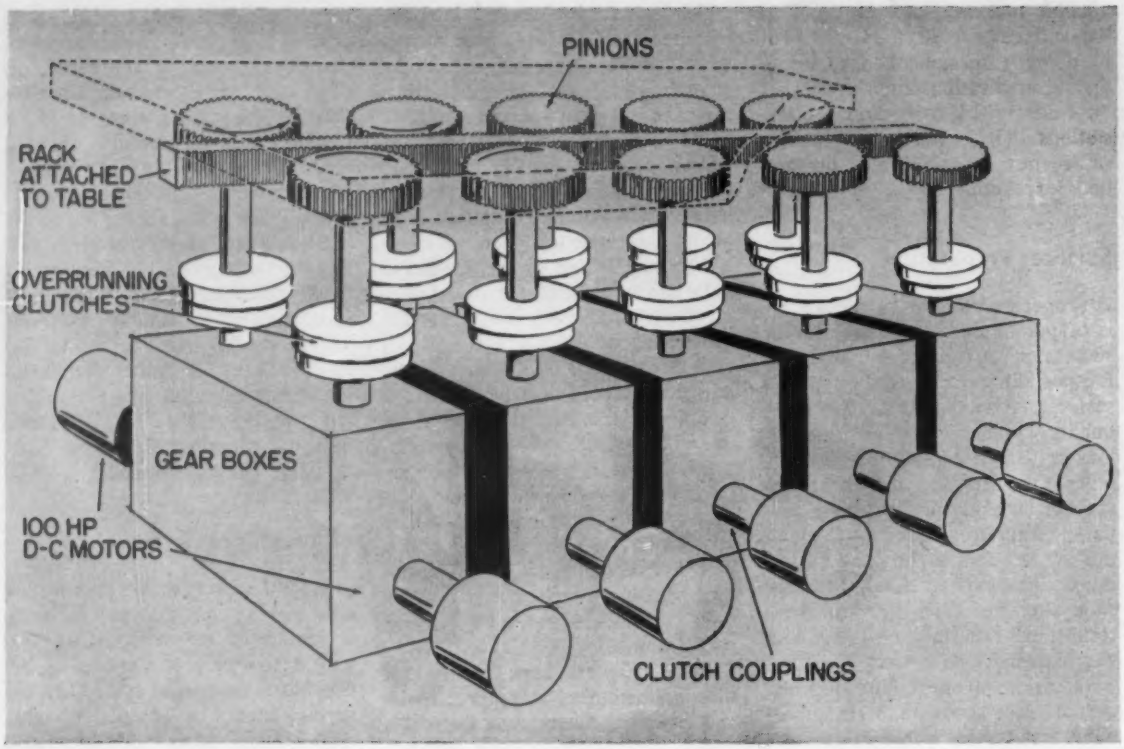
Efflorescence Removal

If efflorescence is present on either old or new masonry surfaces, it should be removed by washing with a five percent solution of hydrochloric (muriatic) acid. Then the surface should be rinsed thoroughly with clean water. Mildew also should be removed before paint is applied.

One method is to scrub the surface with a solution of sodium hypochlorite (bleaching solution) and trisodium phosphate. Steam cleaning is another effective means of removing mildew from masonry. Equipment for this purpose will be found available, particularly in the South. Sandblasting is also highly effective.

The value of a paint for exterior masonry—or for any other surface for that matter—is not determined solely by the merits of any one raw material used in its manufacture. Many low cost paints with marginal durability properties are on the market.

Much progress has been made in recent years in the development of durable, attractive coatings for exterior masonry. Good service and attractive appearance can be counted on from suitable coatings which have been properly applied. Proper surface preparation is essential. Each type of masonry paint has its advantages and also its limitations, and the people responsible should be familiar with these materials and know what these advantages and limitations are. **End**



Pusher-type units may be operated independently to meet changing loads. Individual drive unit can be pulled out for service.

DRIVE UNIT SMOOTHS OUT THE "PUSH" ON GLASS LINE

Power transmission system at this plant was designed for flexibility, ease of maintenance and dependable operation

DOWNTIME DUE TO mechanical power transmission failures is virtually unknown at the Ford Motor Company's highly automated glass plant in Nashville, Tenn. The three-quarter-mile-long line requires continuous operation — 24 hours a day, five days a week.

Credit for helping achieve this production record is given to the transmission system designed for powering the long grinding and polishing line. Equipment necessary to keep this line moving consists of 40 sprag-type overrunning clutch couplings, 20 d-c motors, 10 reduction gear boxes and 20 driving pinions. Their design and arrangement provide complete flexibility in power selection and continuous movement of glass-carrying tables.

There are actually two lines, joined to form an oval, on which the ⅛-in. and ¼-in. thick plate glass is ground and polished for automobile windshields and rear windows. Each of the two lines has 32 grinding and 50 polishing stations.

Because the two parallel lines are joined at either end of semi-circular turnaround sections, the installation has the appearance of being one continuous operation. But, each line represents a complete and self-contained sequence of grinding and polishing operations. Huge cast-iron tables, each weighing about 17 tons, form two continuous ribbons (each 1775 ft long) as they march steadily down the two lines in opposite directions. Fixed to each table, by a bed of plaster, is a section of glass measuring

View of actual equipment and how it is situated under production floor. Rack and pinions are not shown in illustration.

approximately 10 by 14 ft. The glass passes under 82 separate grinding and polishing operations as it travels down the line.

When designing the power transmission system (type of clutches, motors, gear boxes, etc.), consideration had to be given to the following factors. Table ways ride on mating male bedways and there are always 124 tables on each line. This adds up to an inert ribbon of steel weighing 1860 tons plus the weight of glass and plaster. When you add the resistance of 82 grinding and polishing heads, there is a real load to start and keep moving.

In addition, the power transmission system must be flexible to meet changing load requirements, provide for easy maintenance without downtime of lines, and assure that every table moves at a constant speed.

Here's how the power transmission system at Ford operates to fulfill these design requirements.

There is a main drive pit located at the starting section of each line. A drive pit contains five pusher-type drive units which may be operated independently of each other to meet changing loads and provide for continuous operation of the line. Each drive unit consists of two 100-hp d-c motors, two high-speed overrunning clutch couplings, a reduction gear box, two low-speed overrunning clutch couplings and a pair of vertical pinions. According to line speed required, as many as five drive units and 10 motors or as few as two drive units and 3 motors can be used in each pit to supply driving power to a line.

How Power Is Transmitted

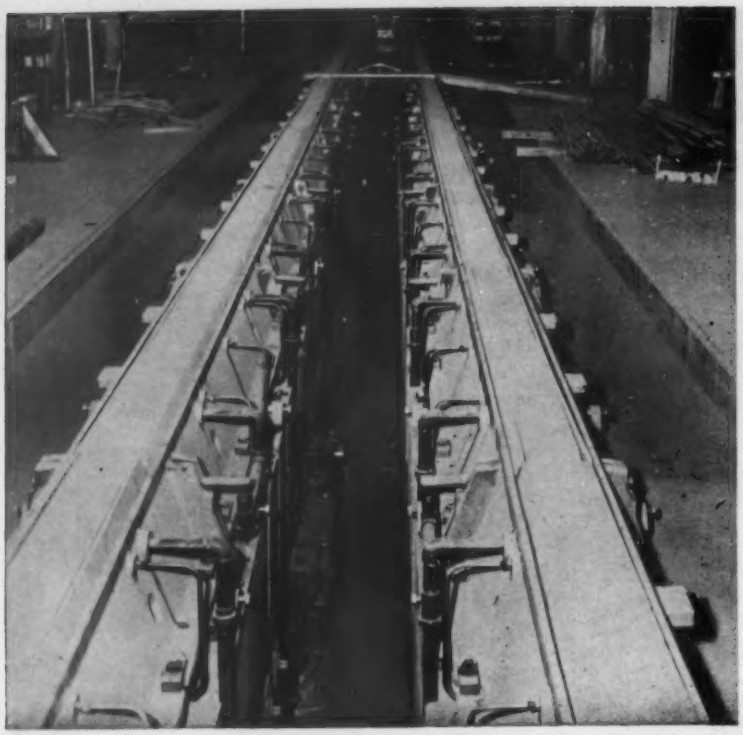
The two motors used for each drive unit are located on opposite sides of a gear box. Power is transmitted from each motor to the gear box through a Formsprag high-speed overrunning clutch coupling. This type of clutch coupling basically consists of concentric inner and outer races with a complement of sprags in the annular space between the races.

When the motor is operating, the sprags, by their wedging action, engage the inner and outer races of the clutch to transmit power to the gear box. The multiple sprags not only provide high torque capacity (3390 ft/lb) in relation to clutch size, but they engage the races at an infinite number of points to greatly reduce wear and eliminate slippage. Also, this sprag-type clutch coupling was selected because of its ability to absorb power surges when motors are started.

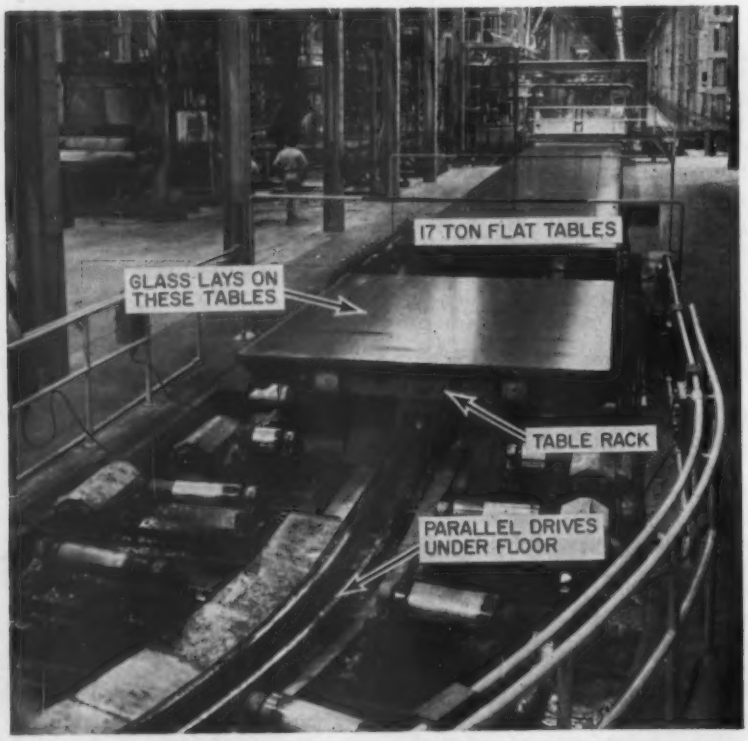
The coupling portion is attached to the motor shaft and the clutch portion is on the gear box in-put shaft. Thus, when the motor is not running, the coupling portion is stationary. This permits the clutch coupling and the motor to be easily serviced, or the motor can be removed and replaced.

At the same time, the motor on the opposite side of the gear box can be operating to transmit power requirement. Thus, continuity and flexibility of drive are inherent along with built-in provisions for easy and safe maintenance.

There are two output shafts rising from the top of each gear box and either or both shafts can be actuated at a given time. Attached to each of



This is a view of the bedways during construction, looking toward one of the main pusher drive pits. Ways are covered with planking for protection of surfaces during the construction period. Finished line is shown in bottom illustration.



Above-the-floor view of three-quarter mile long production line. When in operation, glass sheets will move on 17-ton tables from grinding to polishing operations. Line moves smoothly despite weight of tables and rotating movement of grinders.

these shafts is a large Formsprag clutch coupling having a rated torque capacity of 56,500 ft/lb and capable of taking a 200 per cent power surge when starting the grinding and polishing line.

These low speed, overrunning clutch couplings transmit power from gear box shafts to two vertical pinion shafts that are directly opposed and rotate in opposite directions. Pinion gears on the ends of these shafts mesh with toothed racks extending longitudinally beneath the center of each table. This rack and pinion arrangement imparts forward motion to a table which, in turn, pushes tables ahead of it. When all five drive units in a pit are operating, pinion gears are meshed with the toothed racks on five tables on the line above.

Operation of Drive Unit

When a drive unit is delivering power to a table, the full complement of sprags in the large clutch coupling lock the inner and outer races by their combined wedging action. However, if a motor of a driving unit is shut off, the sprags unlock in the clutch related to the dead motor. Then, the inner race, which is attached to the pinion shaft, free wheels as the pinion gear is turned by racks on tables overhead.

The clutch outer race, attached to the vertical gear box shaft, remains stationary and prevents drive-back from tables to gear box. This provides flexibility in driving power selection. Also, any segment of the drive unit connected to the shutdown motor can be easily serviced while the opposite half of the drive unit continues to supply power to the line.

In addition, complete drive units can be shut down for replacement or repairs without affecting the continuity of driving by the other four units in the pit. By shutting off both motors of a drive unit, the vertical out-put shafts on the gear box are brought to a standstill. This also stops the coupling portions and outer races of the two large clutches.

After anchoring the outer races of both clutches to supporting I-beams, the coupling portions can be unbolted and the entire drive unit pulled out of service. Any single motor or complete drive unit can be removed from service while the grinding and polishing line continues to operate. **End**

When you pick a new plant site, be water-wise—

PLAN WATER SUPPLIES for FIRE PROTECTION

Prepared for PLANT ENGINEERING

By The Staff of the Factory Mutual Engineering Division, Norwood, Mass.

IN SELECTING a new plant site it is important to know that ample water can be made available for fire protection.

Most plants need two water supplies. One supply, frequently referred to as the primary supply, is instantly available to furnish water for the sprinklers that open in the early stages of a fire. The number that open at the start will depend upon the hazard involved, the building construction, and to some extent on the size of building areas.

In general, every plant needs at least 500 gpm as a primary supply for sprinklers. This is based on 25 sprinklers operating with an average discharge of 20 gpm per sprinkler. The minimum pressure required at the top of centrally located sprinkler risers to supply sprinklers effectively in a modern system is 15 psi for a 500-gpm demand, with an added increment of 5 psi for each additional 250-gpm demand.

These higher demands are required by the more hazardous processes because more sprinklers will open initially. Public water systems and elevated tanks are the usual sources of the primary supply.

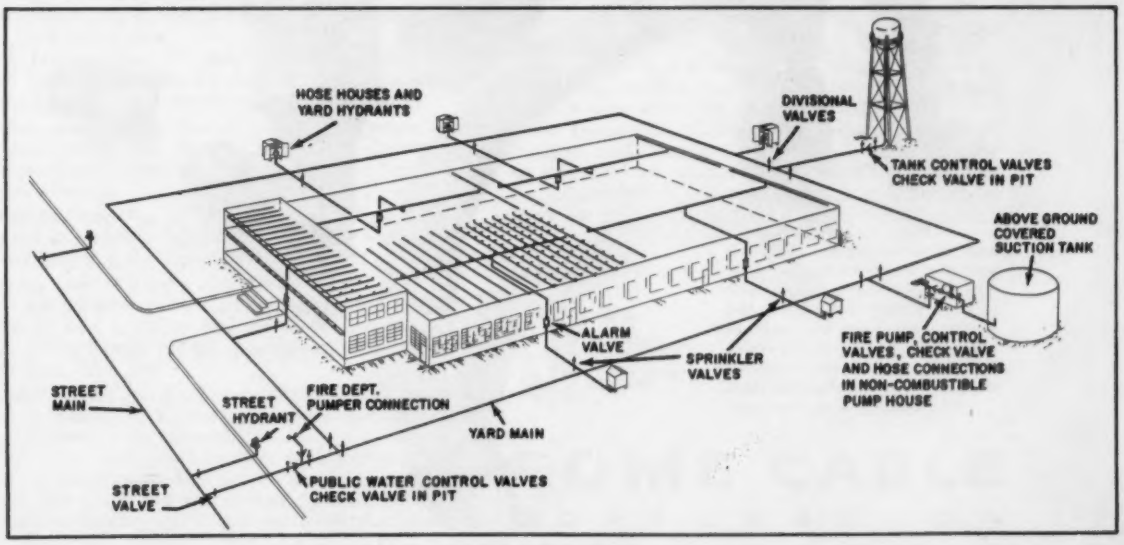
Another supply, frequently called the secondary supply, is needed if the primary is not sufficient to furnish enough water for both sprinklers and hose streams for the duration of a fire, and at large plants may be needed for reliability. A fire pump is the usual secondary supply; most of them being installed today are arranged for automatic operation. In some cases, a strong public water system may be ample for primary and secondary supplies.

Number of streams likely to be required can be estimated with a good degree of accuracy by experienced fire-protection engineers. Some plants of noncombustible construction, engaged in nonhazardous operations and with little or no yard storage, may need to make provision for only one hose stream. Others of combustible construction and with hazardous processes may need as many as four streams, each requiring a water flow of about 250 gpm at pressures of 55 to 75 psi, adequate to provide the maximum practical range. At fires in some occupancies such as paperworking, paper storage, and woodworking, more hose streams may be needed.

A public water system is the best

(Turn to page 132)

Fig. 1. Typical arrangement of water supplies for fire protection. Note connection to public water system at street main, fire pump supplied by above-ground suction tank and elevated tank. Typical piping to sprinklers and hydrants shown.


HOSE HOUSES AND YARD HYDRANTS
DIVISIONAL VALVES
TANK CONTROL VALVES CHECK VALVE IN PIT
ABOVE GROUND COVERED SUCTION TANK
ALARM VALVE
SPRINKLER VALVES
FIRE PUMP, CONTROL VALVES, CHECK VALVE AND HOSE CONNECTIONS IN NON-COMBUSTIBLE PUMP HOUSE
STREET MAIN
STREET HYDRANT
FIRE DEPT. PUMPER CONNECTION
YARD MAIN
STREET VALVE
PUBLIC WATER CONTROL VALVES CHECK VALVE IN PIT

The big blaze leveled both plant and warehouse
. . . nearly a 100% loss of stock! And then . . .

Along came Jones

Tuesday morning—I was just starting off on my calls when the bad news came over the radio:

Fire—a big one—was burning the Niagara Transformer Corporation to the ground! Niagara makes transformers in Buffalo.

Niagara is also my customer. I'm Bud Jones—salesman for Rome Cable.

My first reaction: get over there . . . quick! But when I arrived the damage had already been done. There was nothing to do but wait . . .

Tuesday evening—the details were in the paper. In less than two hours, fire had completely destroyed both plant and warehouse—and nearly one hundred percent of stock.

Wednesday morning—just 24 hours later—Niagara had selected an existing building, signed the lease, and started planning the layout. That's where I came in.

Thursday noon—I got the word. They needed wire and cable for an emergency installation, needed it fast. Niagara's new building had *no* power whatsoever. "Can Rome handle *all* the power requirements?" I was asked. "You bet!"

Thursday, 2:15 P.M.—I relayed the order back to our plant at Rome, N. Y. Voltage requirements. Cable size. Distance to be covered.

Part of the order could be made up from stock. But a special power cable—that had to be strung overhead in the new plant, out the skylight, across the roof, through another skylight and down to the transformer—had to be self-supporting and specially made.

Our engineers came up with a quick—and unique—answer. They had three conductors spiralled around a high-strength messenger. That was done in the Rome plant to save Niagara time on the job.

Thursday, 3:30 P.M.—order completed!

Friday morning—after testing—it was shipped.

Just seven days after the fire, Niagara was on its feet again, winding coils for transformers with Rome magnet wire, which we also supplied in a jiffy!

As Herman E. Gabel, Jr., General Manager at Niagara, said: "Rome did a wonderful job in getting us the cable we needed . . . but that's not startling for Rome! We've felt we could always depend on Rome for quick delivery and imaginative engineering."

MEET THE MAN

WHO'S DEDICATED TO YOUR JOB

YOUR ROME CABLE SALESMAN

Bud Jones' action typifies the type of service you can rely on from your Rome Cable representative. He links you directly and quickly with the facilities and engineering skill at Rome—not only during emergencies but every time you have a wire and cable requirement. When you need help, call your Rome salesman!

ROME CABLE

CORPORATION

For more facts circle 564 on Reply Card

and the most economical source of water supply for private fire-protection systems. Its fire flow is usually of many hours duration and the property owner has little or no problem of maintenance.

Determining Volume, Flow

The volume and pressure of public water available at a proposed plant are determined by means of a flow test at the hydrant on the main nearest the site, see Fig. 2. If this main is some distance away and a long run of new main is needed, calculations based on hydraulic formulae are made to determine the supply that will be available through the new main. This in turn is compared with the needs as determined for the occupancies and size of buildings. For detailed data on calculating hydraulic flows and estimating sprinkler demands, the reader is referred to a handbook on the subject.

If the water department has been supplying water only for domestic use and for limited municipal fire protection, its pumps and other facilities may not be adequate for industrial fire protection. A review of facilities such as pump and filter capacity, water-supply source, electrical power, distribution mains, and history of droughts and floods will determine if the system is both adequate and reliable. Sometimes it is possible for the public water department to correct deficiencies by economically feasible means. If not, the plant must consider some other supply, such as an elevated tank.

Elevated tanks, having capacities of 50,000 to 100,000 gal or more, are the alternative where public water is not available or is inadequate. Kept filled from a nearby body of water or from public mains, a tank furnishes an immediate reliable water supply at good pressure for the early stages of a fire. Its capacity should be sufficient to supply the combined total demand by sprinklers and hose streams for a minimum of 30 minutes. For adequate pressure, the bottom of the gravity tank should be at least 35 ft above the highest sprinklers.

Fire pumps are needed at most plants to back up the protection provided by either public water or tanks. Pumps assure a large volume of water at effective pressures for sprinklers and hose streams. They also increase the reliability of the fire-protection system by providing a substitute supply when tanks must be shut off for maintenance, or if for some reason public mains are shut off temporarily. Large plants usually need fire pumps regardless of the capacity of other sources.

Pumps must have a reliable suction source, such as a reservoir or a tank of adequate capacity. If dependence must be placed on a nearby pond or river, or on driven wells, they should be adequate even during dry seasons. The power supply must be reliable if the pump is to be electrically driven. Otherwise an internal-combustion-engine or steam-turbine drive is used.

Pressure tanks installed at ground level and used in conjunction with automatic-starting fire pumps are another water-supply combination used to a limited extent at smaller properties where public water is not available and where a gravity tank is not feasible.

Case Histories

Four examples of water supply problems investigated by our engineers at new-plant sites, show the desirability of a preliminary check.

For instance, the supply of water available at the site of a proposed warehouse was scant because of small mains in the vicinity. The city had a strong water system, and not far away, tests at a public hydrant showed that with 1400 gpm of water flowing, the pressure was 128 psi. Installation of larger mains from this point to the proposed site made it usable by providing an adequate water flow of 1600 gpm at 45 psi pressure.

In one case, a 12-in. main located about 1000 ft from a plant site could provide ample water but pressures were too low for sprinklers. Water flowing from sprinklers and hose streams during a fire could reduce the pressure at the highest sprinklers to 4 psi, making them ineffective.

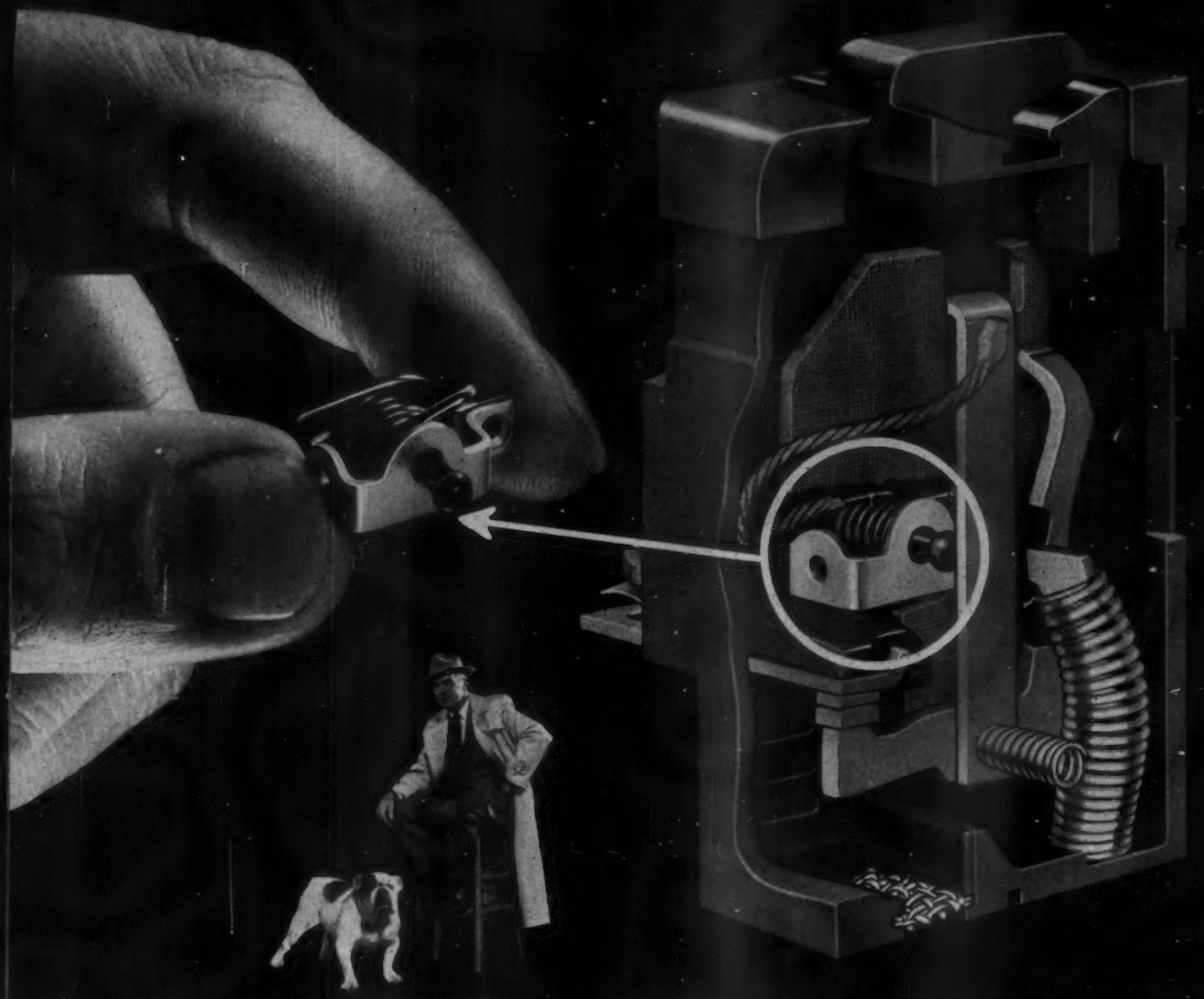
A 40,000-gal tank on a 100-ft tower was recommended as the primary supply, together with a 1000-gpm automatic fire pump which would draw from the public main, boost the pressure, and give an ample total water supply.

Fig. 2. Engineer takes pressure reading of hose stream with pitot gage.

A suction tank solved the problem at a site where a test at a public hydrant showed that 730 gpm of water was available at a flowing pressure of 21 psi, barely enough for sprinklers alone. Calculations indicated that at least 1150 gpm at 55 psi was needed as an adequate supply for the sprinklers and one hose stream. To supplement the public supply and to insure adequate water for planned future expansion, a 1000-gpm fire pump taking suction from a 150,000-gal suction tank was recommended.

In another case, a new plant was to be erected in a remote location where there were no public mains. Construction was to be noncombustible, with only a few areas of combustible occupancy requiring sprinklers. Under these conditions, the sprinkler system's demand for water during a fire would be relatively low.

A 12,000-gal pressure tank and a 750-gpm automatic fire pump taking suction from a 150,000-gal above-ground tank were recommended as the most economical and practical arrangement. The pressure tank would supply water for the first few minutes and the pump would cut in promptly to furnish an ample total water supply. **End**



NO TROUBLE CALLS WITH PUSHMATIC

coil protection is standard in every breaker

Protect branch circuits against high overloads and "flash-shorts" with Pushmatic magnetic coil action! BullDog, the first to offer this protection in 15-amp and 20-amp ratings seven years ago, builds this safeguard *into every Pushmatic® breaker.* The solenoid (coil) —coupled with the thermal element— provides *double* circuit safety. Makes trouble calls a thing of the past.

As you can see in the above picture the Pushmatic uses a *multi-turn coil.* High overloads or "flash-shorts" instantly set up a magnetic field in the coil—causing the metal plunger to trip the latch and break the circuit. BullDog Pushmatics provide not only maximum branch circuit protection, but protect lamp and appliance cords, too!

Small overloads are taken care of by the thermal-bimetal latch. An overloaded circuit heats the bimetal causing the latch to curve and release. A built-in time delay prevents nuisance tripping in case of harmless overloads.

Protect your branch circuits with proved Pushmatic coil action! Each and every Pushmatic is rigidly tested to assure precision operation. You'll find Pushmatic double protection pays off! Multi-turn coils are standard in all Pushmatics — 15 amperes through 50 amperes.

BULLDOG ELECTRIC PRODUCTS DIVISION
I-T-E CIRCUIT BREAKER COMPANY
BOX 177 • DETROIT 32, MICHIGAN

In Canada: 80 Clayson Rd., Toronto 15, Ont. Export Division: 13 East 40th St., New York 16, N.Y.

For more facts circle 565 on Reply Card

NEED MORE COMPRESSED AIR?
These Ideas Helped This Company:

Large manifolds plus additional compressors and interconnection of the air supply in three plant areas

By **KENNETH DEURING, Project Engineer, Facilities Group, Thompson Ramo Wooldridge, Inc., Cleveland, Ohio**

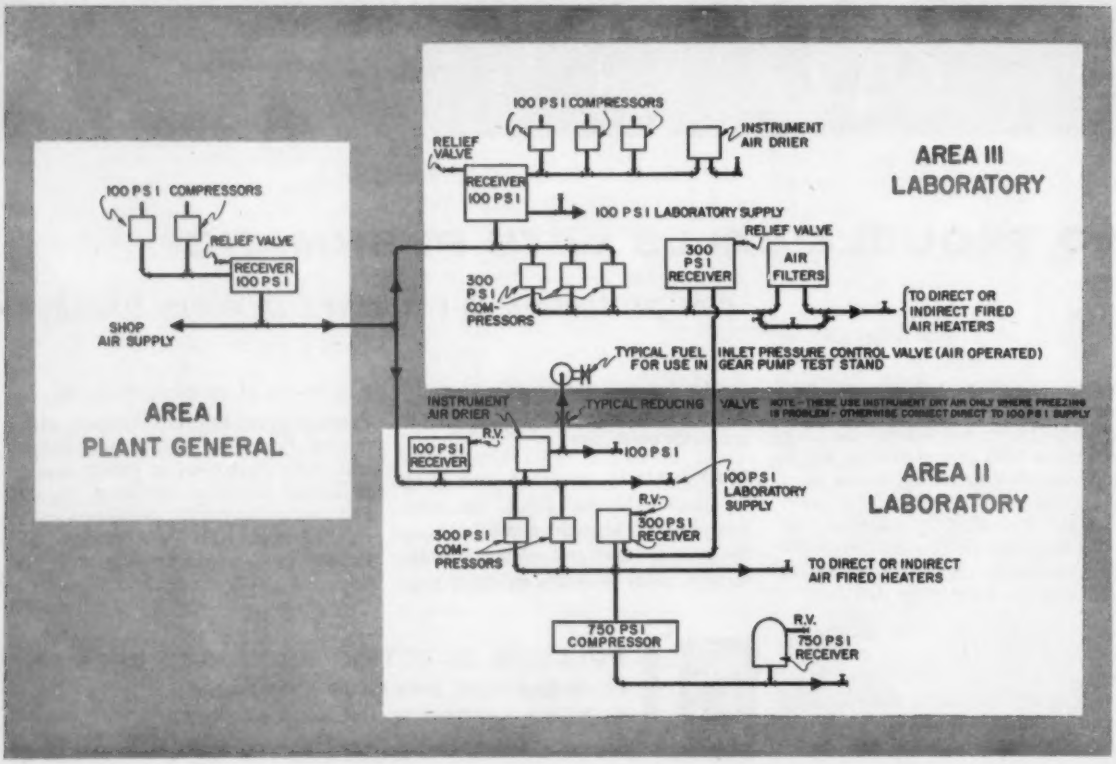
RAPID LABORATORY expansion in the past nine years created quite a problem in planning an economical and flexible compressed air facility.

Compressed air is supplied to the laboratory for many purposes at pressures ranging from several ounces to 600 psig. In addition, air flow demand rates vary from peak capacity to perhaps 50 per cent of capacity over a short interval.

Our solution was to install large enough manifolds for future expansion and to add synchronous motor-driven reciprocating compressors as needed and in a location adjacent to the test facility requiring the additional air. In this manner, additional capacity could be gained with modest capital expenditure and without any shutdowns.

Line losses due to pressure drop are minimized inasmuch as each test area supplies, approximately, its own air. Interconnection of air supplies in the different areas allow

Fig. 1. Schematic shows how compressed air lines from three plant areas are interconnected to maintain pressure.



IT'S EASY TO MAKE A CONNECTION WITH UNIVERSAL LIGHTING DUCT!

BullDog Universal Lighting Duct is extremely easy to *assemble* and *install*. This versatile system offers you 5 methods of suspension to meet installation requirements. The duct is standardized and prefabricated. What's more the entire lighting system can be relocated on the "ULD" without costly rewiring when lighting needs change.

"ULD" is a continuous electrical outlet system, available in 20-amp and 50-amp ratings. Conductors run the entire length of the duct. Two types of twist-out plugs are available to tap power: the *terminal twist-out plug* for direct wiring to lighting fixtures, and the *receptacle twist-out plugs*, which will accept a standard attachment cap. Wherever plant equipment is located, "ULD" plugs twist in to provide power for maximum illumination without causing costly production shutdowns.

You'll find Universal Lighting Duct is less costly than installed pipe and wire. The duct both feeds and supports lighting fixtures . . . is completely reusable when lighting requirements change. And it's U/L listed.

Whether you're modernizing or planning new construction, you'll find BullDog Universal Lighting Duct is the most efficient, economical and flexible lighting duct system available.

BULLDOG ELECTRIC PRODUCTS DIVISION
I-T-E CIRCUIT BREAKER COMPANY
BOX 177 • DETROIT 32, MICHIGAN

In Canada: 80 Clayson Rd., Toronto 15, Ont. Export Division: 13 East 40th St., New York 16, N.Y.

For more facts circle 566 on Reply Card

for emergency breakdowns and additional capacity for a given area when needed.

At the start of turbine test work in 1950, all compressed air was supplied from compressors in the "plant general" area (Area 1) at 100 psi. See Fig. 1. New turbine requirements then called for higher air pressure so booster compressors were added in Area 2, giving manifold pressures of 100 to 300 psig.

Increased business in the alternator drive program necessitated additional space and air capacity. A new building (Area 3) was erected in 1954 to meet this demand. The new building not only included a number of alternator drive test cells, plus supporting equipment, but also included sufficient reciprocating compressors to supply the needed 100 and 300 psi air requirements.

Further expansion in 1956 and 1957 required additional compressors (Area 3). In all cases, reciprocating compressors were added to the existing manifolds to supply air needs for a particular area. Area 3 was also interconnected to the air systems in Area 2 and Area 1 as shown in the schematic.

More Air at Low Cost

Preliminary rocket test work at the Tapco plant required a small amount of 650 psig air late in 1956. In order to meet this requirement quickly, and with low capital expense, it was decided to re-work an existing booster compressor in Area 2. The cylinder of a 300 psig compressor was replaced with a 750 psig cylinder assembly and suitable manifolding was installed. The whole 750 psi air supply was installed quickly and at a low cost compared to the time and cost required for a new compressor installation.

It must be borne in mind, however, that the schematic does not include all valves nor does it show true locations of equipment. A compressor operator is kept on duty at all times when the compressor equipment is running. One of his main duties is to check pressure or loads on the 100 and 300 psi compressors. An excessive demand for air at the 100 or 300 psi receivers would result in a considerable pressure drop, and the compressor operator must start up an additional piece of equipment.

Usually, however, sufficient compressors are kept running so that they are loaded approximately to 50 or 75 per cent of capacity. The unloading valves in the compressors keep the air pressure within limits.

Occasionally peak demand loads occur where additional 100 psi air is required from Area 1, in which case this area must then start up additional equipment. A public address system interconnecting the three areas help the compressor operators coordinate their efforts.

In addition to the problem of supplying sufficient air volume and pressure, the contamination of the supply frequently presents problems. Air turbines require heated air, and in general, indirect-fired air heaters are used for higher temperatures.

Fig. 2. Filter, left, separates the oil and air. Small instrument air drier, lower right side, provides low dew point air to prevent possible freezing of valves on the outside lines.

The problem arises when the compressor lubricating oil, entrained in the air, is burned in a direct-fired heater along with natural gas. Carbon, or soot deposits, plug the small air orifices, causing malfunctions of turbine controls.

Special air filters are used to separate the oil from the air supplied to the direct-fired combustors to preclude such problems.

Another air quality problem is that of operating the valves or air drives out of doors in freezing temperatures. Freezing of air-borne moisture has caused numerous delays and shutdowns.

To avoid this problem, instrument air driers are now used to supply very low dew point air. These driers are reactivated on an automatic cycle and maintain a constant supply of dry air.

Filters, Driers, Heaters

The air filters are large steel pressure vessels containing activated alumina. Room temperature air passes through the activated alumina and in so doing gives up moisture and entrained compressor lubricating oil. Once every shift, these filters are blown down to remove collected water and oil. The activated alumina is replaced once every two years.

The instrument air drier consists of two separate filter beds containing silica gel and an electric air heater. Dry air is obtained by passing the compressed air through one silica gel filter element at room temperature. Simultaneously, the other filter element receives a blowdown to atmosphere of heated air which removes moisture collected from the previous air drying cycle at room temperature. The above cycle is reversed automatically on a four hour schedule.

The air heaters are of two general types. The direct-fired units are hollow cylinders resembling a nail keg in shape. The cold air enters at one end and is mixed together in a swirling action with a correctly metered quantity of natural gas from a burner unit similar to one on a gas stove. The mixture is ignited with a spark plug and the products of combustion plus excess air pass out the other end of the heater. Temperature control is obtained by modulating gas flow to the burner.

In the case of indirect-fired air heaters, the air to be heated is passed through banks of tubing over which gas-fired heat is applied. The gas flame contacts the tubing over a considerable area before being exhausted to the atmosphere. In this manner, the air to be heated is never contaminated with the products of combustion. Temperature control is similar to that used for the indirect-fired heater. **End**

VIBRATION & NOISE CONTROL NEWS

FROM THE APPLICATION ENGINEERING DEPARTMENT OF THE KORFUND COMPANY, INC.

Resilient Mounts Offer Dual Protection — Greater Efficiency

Korfund's steel spring machinery mounts provide dual protection from damaging disturbance . . . They prevent transmission of shock and vibration from disturbance-creating equipment, ("positive" isolation) and they protect precision equipment from outside disturbance caused by other machinery, trucks, trains, etc. ("negative" isolation).

Isolators will often perform both jobs in one installation. For example, they will prevent transmission of vibration from a grinder taking a rough cut—then protect it against disturbance when taking precision cuts.

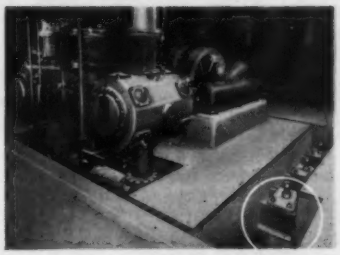
Dual protection, with effectiveness approaching 100%, is another reason why Korfund steel spring mountings are the first choice for critical installations.

Processing Firm Kills Damaging Vibration

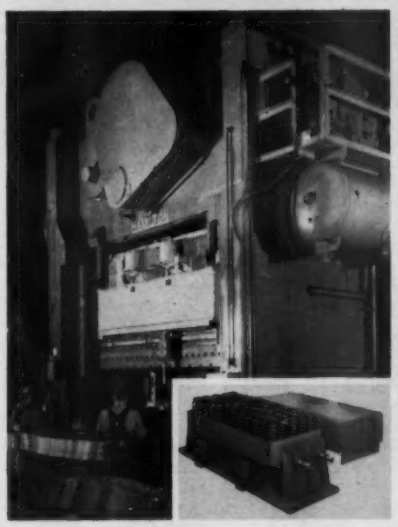
Delicate bacteria cultures upstairs — five heavy-duty, low speed horizontal duplex compressors downstairs — how do you keep structure-transmitted vibration from ruining precision processes?

Adding to this problem at Parke Davis & Company's Detroit plant was limited installation space, which compelled the foundations of the 250 hp machines to overlap the building column footings.

Korfund engineers floated each of the Ingersoll-Rand compressors and its foundation on four spring mounts. Snubbers limit machine movement. Vibration is so completely soaked up that lab workers are unaware when compressors are in operation.



SPRINGS CUSHION 1250 TON PRESS BLOWS. "SOCK" GOES INTO WORK, NOT INTO PLANT.



Impact from 1250 ton press is absorbed by special Korfund spring mounts weighing 2200 lbs. each. Despite tremendous forces involved, dynamic movement is less than 1/8", evidence of the excellent stability provided by the mounting system.

Slamming out auto frame parts from steel blanks is a tough job. And the shock that goes with it is tough on neighboring machines, building structure, operating crews, and the press itself.

Engineers at A. O. Smith Corp. in Milwaukee have studied this problem for many years. When planning the installation of a new 1250 ton capacity Hamilton press, truly effective shock absorption was required to cushion the 600,000 pounds of weight and mechanical force delivered at each blow.

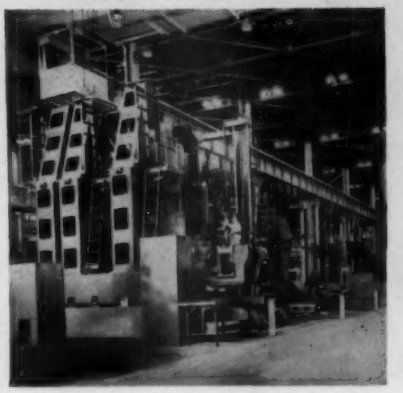
Korfund engineers "rode" the big press on special steel spring mountings (inset). It is now possible to stand close to the press, and feel no vibration or shock at the moment of impact. All the "sock" goes into the work where it belongs, and is kept out of the building structure.

At thousands of other plants, too, Korfund resilient mounts provide measureable benefits in lower maintenance and foundation costs, increased production and employee efficiency.

"Negative" Isolation Spells Positive Protection For Alcoa's Huge Die Sinkers

In the USAF Heavy Press Plant at Alcoa's Cleveland Works, precision die-sinkers automatically cut impressions into 100 ton steel die blocks. Though weighing 85 tons and mounted on 300 ton foundations, the giant Cincinnati Hydrotels and Pratt & Whitney Kellers — twelve machines in all — could be affected by shock and vibration from nearby forging hammers and presses. Dies worth tens of thousands of dollars demand precision work and absolute protection against these disturbances.

Work accuracy was insured by floating each giant die-sinker and its foundations on Korfund resilient mountings. Though the isolators provide several inches of static "cushion", there is no dynamic movement of the machines.



The same principle of "negative" isolation is applied to many other types of equipment, including furnaces, jig borers, roll grinders, sound-test rooms, instruments — even entire floors of a structure.

FOR MORE DATA OR SPECIFIC RECOMMENDATIONS WRITE TO KORFUND FOR BULLETIN #69

KORFUND

THE KORFUND COMPANY INC.

48-35R Thirty Second Place • Long Island City 1, New York

Over half a century of VIBRATION • SHOCK • NOISE / CONTROL & MEASUREMENT

Vibration & Shock Isolators • Flexible Connectors • Vibration Instruments • Acoustical Products

For more facts circle 567 on Reply Card

NEW PLANT CONSTRUCTION —advance information on location, costs

Newark, Calif.—Pacific Car & Foundry Co., Fifth & Factory Streets, Renton, Wash., plans to construct a truck manufacturing facility here. Work is already under way and plant is scheduled to go into operation by late 1960. Cost reported to be about $2 million.

Richmond, Calif.—Air Reduction Pacific Co., Division of Air Reduction Co., Inc., 150 E. 42nd Street, New York, N. Y., will start construction at once on a $3-million air liquefaction plant. The plant will be designed to turn out about 30 tons of liquid oxygen per day, liquid nitrogen and purified argon. Work under direction of Stolite, Inc., construction contractors, will get under way at once for completion by late 1960.

Wilmington, Calif.—The Texas Co., Chrysler Towers, New York, N. Y., plans a multi-million dollar expansion at company's refinery here. New units will be constructed, such as a catalytic reformer and a hydro-treater, which supplement similar units already in operation. Work on the expansion will begin soon for completion by early 1961.

Gainesville, Fla.—Sperry Electronic Tube Division of Sperry Rand Corp., 30 Rockefeller Plaza, New York, N. Y., plans expansion of company's microwave tubes manufacturing for advanced radar, missiles and counter measure systems. Schedule calls for increasing plant manufacturing space to 121,000 sq ft by February 1960, increasing the total plant value to more than $6 million and increasing the plant site to 112 acres.

Tampa, Fla.—General Portland Cement Co., 111 W. Monroe St., Chicago, Ill., plans an expenditure of more than $17 million for expanding and modernizing present manufacturing facilities. A substantial part of the projected outlay will be used to enlarge capacity at the Tampa, Fla., operation. Work will begin soon for completion by the spring of 1961.

Rome, Ga.—Mead Corp., Dayton, O., and Inland Container Corp., Indianapolis, Ind., have organized a jointly owned subsidiary to provide additional paperboard supplies to the parent companies. Facilities of the new company, Forest Kraft Co., will be constructed at the mill of Rome Kraft Co., which is equally owned by Mead and Inland Container. New plant will have a daily capacity of 500 tons of containerboard and will be completed in the late second half of 1961.

Elk Grove Village, Ill.—Sola Electric Co., 4631 W. 16th St., Chicago, Ill., plans to construct a plant here for the production of transformers and voltage regulators of all types. Construction will begin immediately and the plant is scheduled to go into production by the summer of 1960. New plant will cost an estimated $2 million when completed.

Plaquemine, La.—Dow Chemical Co., 1000 Main St., Midland, Mich., plans a major expansion and improvement program at company's Louisiana division. Plans include construction of a large manufacturing plant for the production of polyethylene and other facilities for the production of vinylidene chloride and chlorothene. Engineering and construction work will get under way at once with the polyethylene plant slated to go on stream in about 18 months and the other two facilities by the summer of 1961. The expansion will cost approximately $12 million.

Midland, Mich.—Kaiser Aluminum & Chemical Corp., 1924 Broadway, Oakland, Calif., plans a major expansion program for its refractory magnesia operations located here. Chief product of the new $3-million plant will be periclase, a dense crystalline magnesia. Initial capacity will be about 45,000 tons per year. Construction is scheduled to get under way at once for completion in 1960.

Clifton, N. J.—Bright Star Industries, 602 Getty St., plans major expansion of production facilities here for the manufacture of electrolytic manganese dioxide. Plant will go into operation the latter half of 1960.

Somerville, N. J.—American Vitrified Products Co., National City Bank Bldg., Cleveland, O., plans to construct a $4-million plant for the production of vitrified clay pipe and kindred products. Work on the new plant will get under way at once and will be completely automated.

Morganton, N. C.—Henderson Furniture Industries, Inc. plans major plant addition to facilities here for the manufacture of furniture and related products. New construction will provide additional manufacturing area of approximately 100,000 sq ft and will cost about $500,000 when completed. Work will begin at once for completion by the second half of 1960.

Raleigh, N. C.—Chemstrand Corp. plans construction of a multi-million dollar research laboratory. Construction will begin at once and initial research operations will start in 1960.

Akron, O.—Firestone Tire & Rubber Co., 1200 Firestone Parkway, this city, plans a $55-million expansion and improvement program over its worldwide production facilities over the next two and a half years. Expansion and modernization programs are already under way or scheduled for company tire plants in Akron, O., Pottstown, Pa., Memphis, Tenn., Des Moines, Iowa and Los Angeles, Calif. Other U. S. facilities tagged for expansion are the synthetic rubber plant at Lake Charles, La., the plastic plant at Pottstown, Pa., and the defense and industrial products plant at Magnolia, Ark.

Akron, O.—General Tire & Rubber Co., this city, plans major expansion program of company's Textileather Division to cost in excess of $1 million. Plans include construction of a manufacturing building and a high-speed calender to produce unsupported vinyl sheetings, laminated vinyl materials and semi-rigid and rigid plastics. Construction of the new plant will get underway soon for completion by late 1960.

Akron, O.—General Tire & Rubber Co., 1144 E. Market St., plans a multi-million dollar expansion program of company's facilities for the manufacture of vinyl plastic flooring. Expansion program will more than double its present vinyl plastic flooring and counter top production capacity here.

Chillicothe, O.—Johns-Manville Corp., 22 E. 40th St., New York, N. Y., has awarded contract to the Turner Construction Co., Gwynne Building, Cincinnati, O., for construction of a one-story, 80,000-sq ft steel and concrete asbestos cement plant for the production of floor tile. Work will begin at once for completion by late 1960. Cost will be about $1 million.

Mingo Junction, O.—Wheeling Steel Corp., Wheeling, W. Va., with Hydrocarbon Research, Inc., of New York, have formed a jointly owned company to build and operate a $6 million oxygen generating plant here. The new concern has been incorporated under the name of Mingo Oxygen Co. New plant, completion of which is expected by mid-1960, will have a rated capacity of 400 tons of oxygen per day, with provisions for future expansion.

Tulsa, Okla.—D-X Sunray Oil Co., plans construction of a solvent dewaxing plant at company's refinery here. Plant, to cost in excess of $7 million when completed, will have a production capacity of 70 million lb of paraffin and microcrystalline wax annually. New unit will be constructed by the Foster-Wheeler Co., New York, N. Y.

Portland, Ore.—Pennsalt Chemicals, Inc., Philadelphia, Pa., has authorized a budget of $2 million for boosting the production of ammonium perchlo-

(Continued on page 200)

For more facts circle 568 on Reply Card ——→

62% MORE POWER

Drill for drill, pound for pound, Black & Decker gives you more power than ever before. This new ½" Special Drill, for example, gives you 62% more power than its predecessor. Yet, it weighs 20% less—costs 8.5% less. That's the kind of development you expect **from the electric tool leader.....**

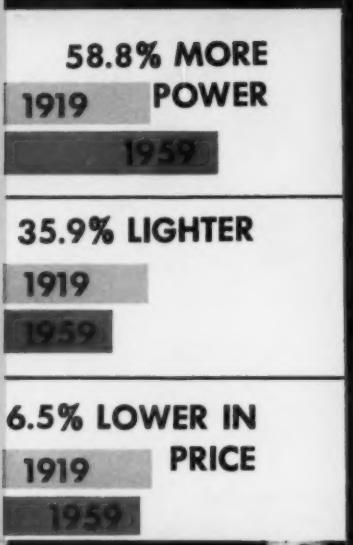
SINCE 1919

Now Black & Decker gives you

TWICE THE VALUE

in the world's most complete drill line

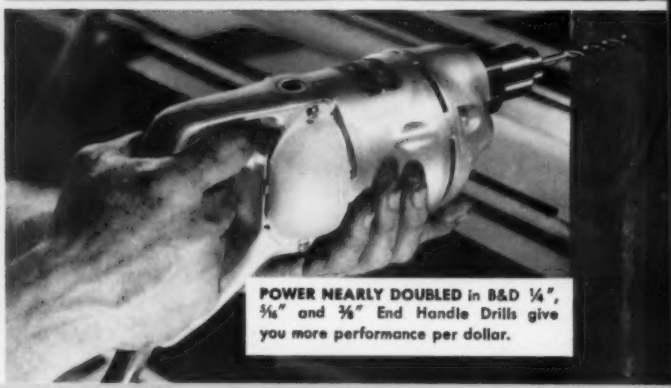
A glance at the chart quickly shows the outstanding progress in Black & Decker drills. But, that's only part of the story. During the past two years, new motors, new compactness, new streamlining have been introduced into the Black & Decker line. Add extra value features like full-power in reverse at no extra cost—you'll see why you now get *up to twice the value per dollar!* The tools shown below are but a few in the all-new Black & Decker drill line. Check their outstanding features. For top value every time be sure to see the Black & Decker line at your Distributors!



MOST POWERFUL DRILL of its size, the ¼" Standard. Powered to pull a locomotive. Full power in reverse.

TREMENDOUS TORQUE developed by this ⅜" H.D. Holgun® takes on tough ones with ease. A tool "best buy."

DRILLS UPSIDE DOWN! B&D Magnetic Drill Presses stick like glue . . . work in any position. 1¼" and ¾" capacities.



POWER NEARLY DOUBLED in B&D ¼", 5/16" and ⅜" End Handle Drills give you more performance per dollar.

—MAIL COUPON FOR FREE DEMONSTRATION—

Look Under "TOOLS-ELECTRIC" in Yellow Pages

THE BLACK & DECKER MFG. CO.
Dept. 9876 Towson 4, Md.

☐ Please arrange a demonstration of..... drill(s)

☐ Send me information on tools checked below

Name..... Title.....

Company.....

Address.....

City..... Zone..... State.....

☐ Vacuum Cleaners

☐ Belt Sanders

☐ Scruguns®

☐ Hammers

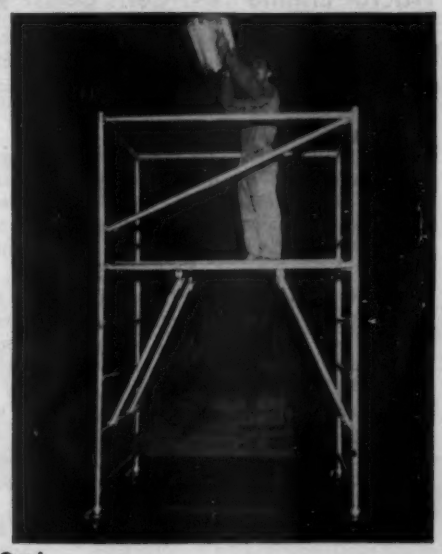
YOU GET A Better Value FROM

Black & Decker®

Quality Electric Tools

Aluminum Rolling Scaffold RAISES Efficiency ...LOWERS Maintenance Costs

Preventive maintenance is an economic necessity which accounts for millions of dollars of savings in equipment and materials each year. It can be costly in time, labor and life. However, when the job calls for getting off-the-ground . . . there's no safer, more economical way than with Aluminum Stairway Scaffolds. Scientifically designed, they are available in two basic styles. *Aluminum Sectional Scaffolds* are erected from separate frames, braces and stairways. All sections of "Fold-A-Way" Scaffolds fold into compact units. Base dimensions of both types are 4'6" x 6'. *Sectional Ladder Scaffolds* can be 29" or 4'6" wide in lengths up to 10'. Both styles are UL Approved. Shown at right: High clearance base section for all four scaffold types. Write for BULLETIN G-205RR



FOR GREATER SAFETY . . . EFFICIENCY . . . ECONOMY

GOLD MEDAL LADDERS SCAFFOLDING

THE PATENT SCAFFOLDING CO., Inc.

38-21 12th Street, Dept. PE, Long Island City 1, N. Y.
1550 Dayton St., Chicago 22, Ill.
West Coast: 6931 Stanford Ave., Los Angeles 1, Calif.
In Canada: 355 Dufferin St., Toronto • Branches in all Principal Cities

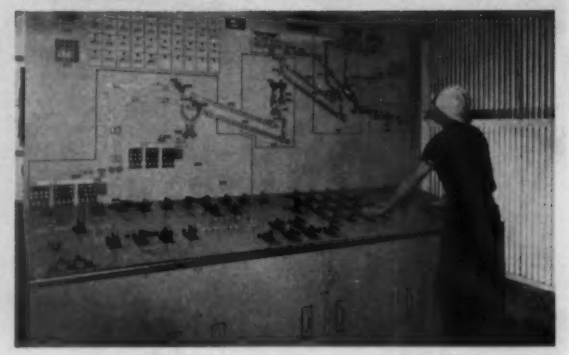
For more facts circle 569 on Reply Card

Coal Handling System Controlled From Single Panel, By One Man

START UP OF THE Thos. H. Allen Electric Generating Station in Memphis, Tennessee, recently put into action one of the nation's largest coal handling systems. The station, designed and constructed by Burns and Roe, Inc., consists initially of three turbine-generator units, each with a nominal rating of 250,000 kw. Steam is produced by three individual two million pound-per-hour boilers. Seven cyclone furnaces serving each of these three units are fed by the coal handling system.

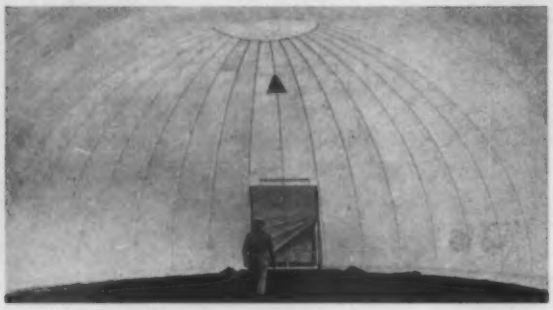
This system, engineered and constructed by Link-Belt Co., conveys the coal in three basic streams: from barge unloading tower to transfer tower to crusher house to bunkers; from barge unloading tower to transfer tower to outdoor storage; from outdoor storage to transfer tower to crusher house to bunkers.

At the barge unloading tower, twin 12-ton-capacity buckets can empty two 1500-ton coal barges simultaneously, dumping the coal into unloading hoppers. Four 60-in.-wide belt feeders beneath the barge unloading hoppers deliver coal to two 48-in.-wide belt conveyors. These conveyors, operating at 450 fpm, each deliver 1100 tons of coal per hour to the transfer tower where it can be directed to outdoor storage or two bunkers inside the station.



Top floor of the coal transfer tower contains the control room and master control panel for the entire coal-handling system. From this panel, one man can control the entire system, from barge unloading hoppers to stockpiling or bunker storage. A flow diagram, laid out on the control panel with indicator lights at key transfer positions, shows the operator at a glance just which portions of the conveyor system are in operation.

Refinery Uses Air-Inflated Building for Oil Drum Storage



A DIFFERENT SORT of storage building—which can be inflated in five minutes—is in use at the Esso Standard Oil Company refinery in Bayonne, N. J. Made of fire-resistant synthetic fiber coated with plastic, it is designed to withstand winds up to 75 miles per hour.

Three pounds of air pressure inside the building take the place of columns, trusses and beams in providing support. A low-pressure blower, located outside the air-house, keeps it inflated. Should the blower fail, it would take about an hour for the 40-ft by 80-ft air structure to deflate.

Storage area inside the building will accommodate up to 900 drums of lubricating oil.

Tractor Engine Test Cells Boast Water-Cooled Walls, 60 Air Changes Per Hour

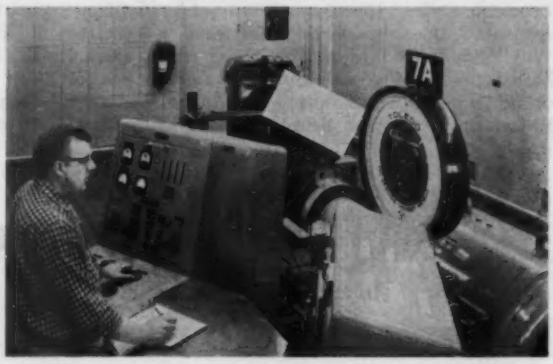
BRINGING UNDER ONE ROOF nearly all the scientific and technical staffs responsible for their farm machinery program, International Harvester Co. has constructed a Farm Equipment Research and Engineering Center near Hinsdale, Illinois.

Three basic engineering functions are being performed at the Center—advanced engineering, product engineering and test and development. The latter section includes fifteen test cells, twelve equipped for engine testing with dynamometers, the remaining three fitted for testing carburetors, air cleaners, and take-off units.

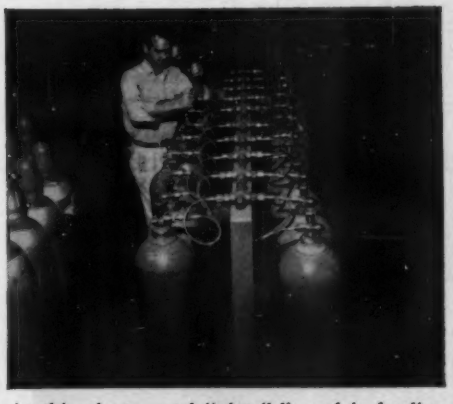
The side walls and ceiling of each test cell are covered with panels that combine acoustic and radiant heat absorption properties. Behind the panels is a series of tubular coils, through which chilled water is circulated at a rate of 35 gallons per minute, to carry away the radiant heat generated by the engines on test. Even with the 60 air changes an hour provided for the cells by the ventilation system, the wall temperatures would be well over 110 F, if they were not cooled by this circulating water system.

Water used to cool the engines is pumped from a lake on the site. It is piped through heat exchangers, rather than through the radiators of the test engines—thus conserving well water and reducing test cell temperatures.

Smoke and exhaust from the test engines are carried underground to a large tile suction exhaust system. Water is injected at each engine to reduce temperature and noise.



Meet your needs for LONG FLEX LIFE with hose of Du Pont TFE resins



At this plant, metal "pigtails" used in loading N_2O and CO_2 lasted only 3 months. Rubber-hose life was even shorter. Hose lined with TEFLON TFE resin has been in use one year without failure. It withstands the flexing and impulsing, even at their 0°F. loading temperatures.

Hose-maintenance problems caused by continuous flexing, torque stress or vibration are substantially reduced with hose lined with TEFLON TFE-fluorocarbon resins. Tough and flexible, this hose provides exceptional durability under constant twisting, vibration and flexing. It is completely inert to virtually all chemicals, is rated for continuous use up to 500°F., easily handles live steam and superheated water.

In addition, hose lined with a TFE resin offers maintenance engineers the cost-saving advantages of re-usability and interchangeability, because this durable hose is easily cleanable, non-adhesive and non-contaminating. And now, new constructions, especially for industrial applications, include fiber reinforcements, elastomeric coverings, convoluted tubing of TEFLON for greater flexibility, and a variety of industrial couplings.

Find out more about how hose of TFE resins can help solve *your* maintenance problems. Consult your hose supplier or write to E. I. du Pont de Nemours & Co. (Inc.), Polychemicals Department, Room 338, Du Pont Building, Wilmington 98, Delaware.

In Canada: Du Pont of Canada Ltd., P.O. Box 660, Montreal, Quebec.

TEFLON is Du Pont's registered trademark for its fluorocarbon resins, including the TFE (tetrafluoroethylene) resins discussed herein.

DU PONT REG. U.S. PAT. OFF. **TEFLON®**

TFE-FLUOROCARBON RESINS

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

For more facts circle 570 on Reply Card

Machines Take Over "Paul Bunyan" Chores in New Wood Processing Mill

MATERIALS HANDLING EQUIPMENT used at Johns-Manville's new Klamath Falls, Oregon plant is designed to minimize physical effort and safety hazards for the employees. Beginning with a large crawler crane, used to move the raw material—eight-foot logs—onto a conveyor from the woodyard, mechanical handling is used in almost every step of the process.

Conveyors carry the logs to slasher saws (where they are cut into four-foot lengths) then to a barking drum (where the bark is removed) then to soaking tanks (where the logs are soaked in hot caustic solution).

An overhead crane, running on overhead outdoor tracks, uses a grab to pick up the logs at the end of the soaking period. Another conveyor carries them to grinders, where the logs are mechanically ground and mixed with water to form groundwood stock.

The board-forming machine itself is a conveyor, and the processed board emerges from the machine as cut sheets, moving on roller-bed conveyors. Still not handled manually, they move through the 623-ft-long dryer. Cutting and packaging operations are built around roller conveyors, and the finished product, wrapped and stacked, is delivered by lift trucks to rail cars and trucks for shipment.

Airplane Takes Off, Flies, Descends and Lands . . . All Under Water

SUBMERGED IN 395,000 gallons of water, the fuselage of a Convair 880 jet transport has begun six months of pressure testing at the Convair (San Diego) Division of General Dynamics Corp. The full fuselage was hung from its stub wings in a water tank 110 ft long, 50 ft wide and 24 ft deep, for hydrostatic tests of the structure under internal pressure.

For the tests, the airplane is filled with, and surrounded by, water. The cabin is sealed as in flight. Water pressure inside is pumped up to 8.6 psi—a pressure in excess of the 8.2 psi used when the airplane flies. Loads simulating those experienced in flight and upon landing are applied. Whiffletrees linked to metal straps attached to the fuselage are operated by hydraulic rams to apply the loading.

Through a combination of fuselage pressurization and application of loads, the hydrostatic test simulates taxi operations, flight in rough air, descent and landing—all within a one-minute period. This cycle is repeated 50,000 times, simulating as many flights.

The tank will be drained for inspection of the fuselage periodically during the six-month test. Inspection will also be made remotely with underwater television cameras and directly by Convair engineers, using diving equipment.

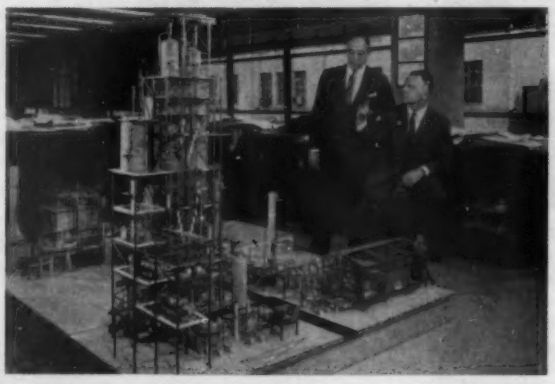
Scale Model, 1/33 Actual Size, Replaces Design Drawings in Plant Construction

CONSTRUCTION of the East Coast's first major urea plant, representing an eight-million-dollar joint venture of Sun Oil Co. and Olin Mathieson Chemical Corp., began recently at North Claymont, Del.

Simultaneously, a plant model, valued at $30,000, was unveiled. The model, developed by M. W. Kellogg Co., who will construct the plant, is complete in every detail. It will save significant time and money in the construction of the plant.

Instead of making hundreds of drawings and many times that number of blueprints, designers created the plant directly on the model, in ⅜-in. scale, or 1/33 actual size, using a special Kellogg "push-fit" technique to assemble the 80-odd components.

Most important result of designing through the use of models is a better plant. Because each pipe run or each exchanger bank is visualized in advance as it will actually appear in the complete plant and in its proper relation to all other elements, optimum arrangements are quickly made. Changes which would be costly to make in the field take but a moment on the model.

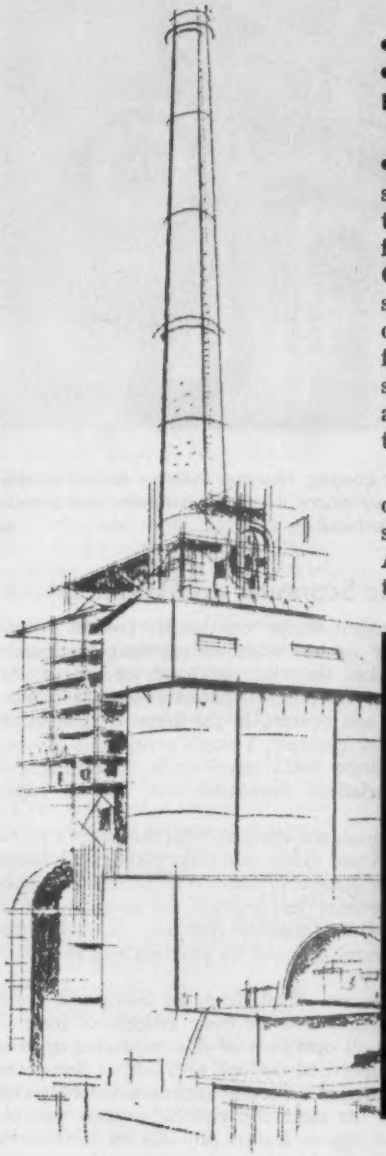


ONE OF THE GARLOCK **2,000**

IT'S GOOD PIPING PRACTICE TO USE

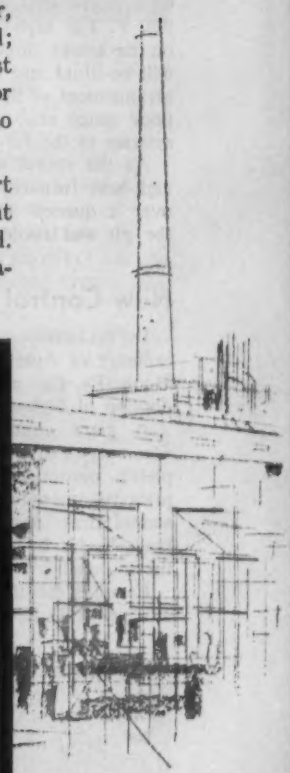
Garlock Rubber Expansion Joints

• Prevent Stresses • Eliminate Vibration, Noise • Compensate for Misalignment • Reduce Flange Breakage



• Garlock All-Rubber Expansion Joints react to the slightest pressure . . . provide complete piping protection at all times. Moreover, they are internally reinforced with steel rings to assure greater strength. Garlock spool type rubber expansion joints are made in sizes ¾" to 84" inside diameter; in round, rectangular, offset, multiple arch, concentric and eccentric tapered; for use against water, oil, mild acids, gases, and exhaust steam. "U" type expansion joints are available for applications ranging from lightweight equipment to turbines.

Rubber Expansion Joints are another important part of "the Garlock 2,000" . . . two thousand different styles of packings, gaskets, and seals for every need. Ask your Garlock representative for his recommendations, or write for Catalog AD-137.



THE GARLOCK PACKING COMPANY, Palmyra, N. Y.

For Prompt Service, contact one of our 26 sales offices and warehouses throughout the U. S. and Canada.

GARLOCK

Packings, Gaskets, Oil Seals, Mechanical Seals, Molded and Extruded Rubber, Plastic Products

Canadian Division: The Garlock Packing Co. of Canada Ltd., Plastics Division: United States Gasket Company

For more facts circle 571 on Reply Card

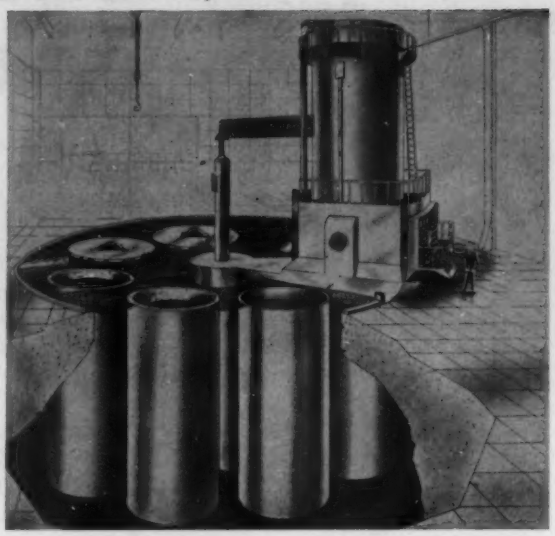
Heat Treat Facility for Rocket Cases Features Circular Layout

WORK HAS started on a million-dollar heat treatment facility for the manufacture of cases for solid-propellant rocket motors. Scheduled to be in operation by March 1960 at General Electric's Flight Propulsion Laboratory, Evendale, Ohio, the new furnace—one of the largest of its type in the world—will facilitate the processing of rocket cases up to 30 ft in length and 10 ft in diameter. The furnaces will have the capability of being expanded to handle cases up to 40 ft long.

The furnace system, which will be built by GE's Industrial Heating department, will consist of a high-heat hardening furnace with temperature capabilities up to 2000 F and several below-floor-level 130-degree furnaces. Special zones within the furnaces will be controlled to within 15 degrees.

In operation, each rocket case, after fabrication, will be lowered into one of the pit furnaces and heated to 900 F. The high-heat furnace will then be rolled around on its tracks directly over the preheated case; the case will be lifted into it by a built-in chain hoist. The circular arrangement of the furnace components will minimize the floor space and, in addition, simplify the utility supply systems to the furnace.

As the rocket case is brought up to temperature, the high-heat furnace will move again to a position directly over a quench station, where the case is lowered into the pit and cooled. Cooling agents are air, molten salt and water. After cooling, the case will be moved to still another pit furnace where it will be tempered and drawn to the desired hardness.

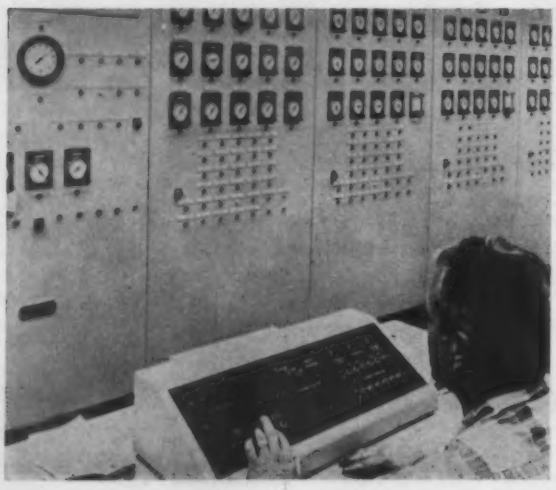


New Control Center Features Graphic Panel, Automatic Scanning and Logging

INSTALLATION of the largest control center in private industry at American Viscose Corporation's new Marcus Hook, Pa. film plant is making possible continuous production of high-quality cellophane.

A giant control center, including specially-designed accessory instrumentation, has made this the most completely automated systems facility among all packaging materials manufacturers. Engineers and production personnel from American Viscose worked with technicians from Taylor Instrument Companies to design and develop the system.

Features of the plant that rank it among the most modern of its type are not in the basic production process; rather, the equipment design and precise control instruments are the new aspects. Wherever practical, continuous processing has taken the place of batch operations. At almost every stage there are important variables requiring measurement and control. In the initial processing of the pulp sheets, for example, a single continuous process replaces two separate batch steps—thus eliminating the usually wider variations associated with manual regulation.



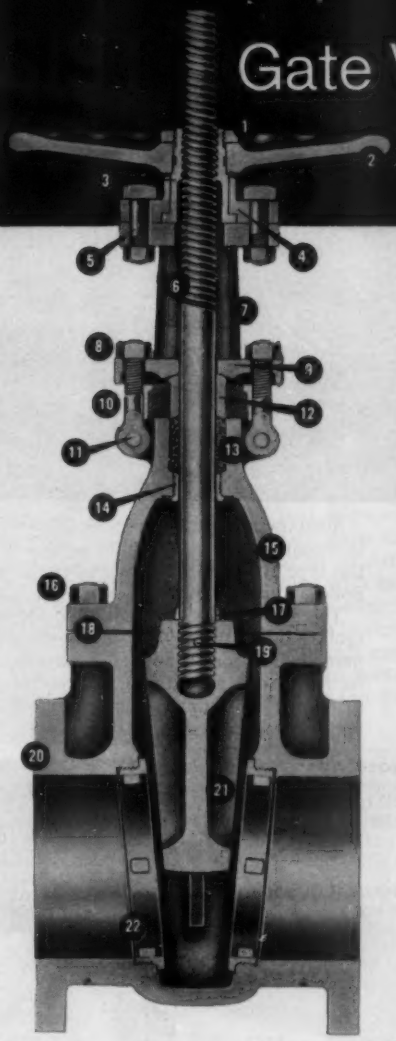
In another instance, the complexity of the control problem, alarm system and safety interlocks make it advisable to have a graphic picture of the entire process to assist the operator. One man can oversee the operation of a large and complicated chemical process, and with the aid of a graphic panel, can quickly pinpoint any abnormal conditions.

Highlight of the new plant, from an instrument point of view, is the area where the basic cellophane sheet is formed. The over-all operation of this important stage is monitored and supervised by one operator at one location. Here the system incorporates automatic scanning and data logging with the more conventional process control. The scanning and logging feature provides for continuous monitoring of all variables at a faster rate than would be possible by an operator checking individual instruments.

Information on the entire process is immediately available to the control room operator; at selected intervals, a permanent typewritten record of all variables is prepared automatically.

Any changes in process characteristics are graphically shown and, as a result, the operator can make adjustments without leaving his station. However, more than 95 per cent of the time, instrumentations make corrections without any manual control.

You extend valve life in Corrosive and Erosive services TWO WAYS when you Specify for Gate Valves, too



No. 1... when you specify "Jenkins" you get not merely "Ni-Resist" metal but you get Type 2 Ni-Resist Cast Iron! That affords extra resistance to acids, salt and alkaline solutions, sea water, brine and other corrosive and erosive fluids, vapors or gases. It is copper-free and will not contaminate or discolor the materials controlled.

Type 316 Stainless Steel is used for the wedge, spindle and other trimmings to give you a combination of metals which have remarkable ability to withstand destructive service.

No. 2... you get all the excellence which the Jenkins Diamond trademark has represented for nearly a century. The superior design and construction are visible here. Equally important superiorities which show up only in the records of long service and low maintenance are the close grain and high density of Jenkins castings ... the precision of Jenkins machining ... the rigid inspection and testing which every Diamond-marked valve undergoes.

It costs no more to buy Ni-Resist Gates made by Jenkins. And, it may cost much less to USE them. Write us, or ask your Jenkins Distributor for information folder No. 205.

1 Bronze yoke bushing nut
2 Handy grip iron wheel
3 Bronze yoke bushing
4 Iron yoke cap with zerk fitting for lubricating bushing
5 Steel yoke cap bolts and nuts
6 TYPE 316 STAINLESS STEEL spindle
7 NI-RESIST CAST IRON, TYPE 2, yoke
8 Bronze eye bolt nuts
9 Malleable iron gland flange
10 Steel gland eye bolts
11 Steel gland lug bolts and nuts
12 TYPE 316 STAINLESS STEEL gland
13 Teflon impregnated asbestos packing
14 TYPE 316 STAINLESS STEEL bonnet bushing
15 NI-RESIST CAST IRON, TYPE 2, bonnet
16 Steel bonnet bolts and nuts
17 TYPE 316 STAINLESS STEEL spindle ring
18 Asbestos gasket
19 TYPE 316 STAINLESS STEEL wedge pin
20 NI-RESIST CAST IRON, TYPE 2, through-port body
21 TYPE 316 STAINLESS STEEL solid I-beam wedge
22 TYPE 316 STAINLESS STEEL seat rings

JENKINS VALVES

LOOK FOR THE JENKINS DIAMOND

Sold Through Leading Distributors Everywhere

JENKINS BROS., 100 Park Avenue, New York 17, N. Y.

Send folder No. 205 describing Ni-Resist Gate Valves

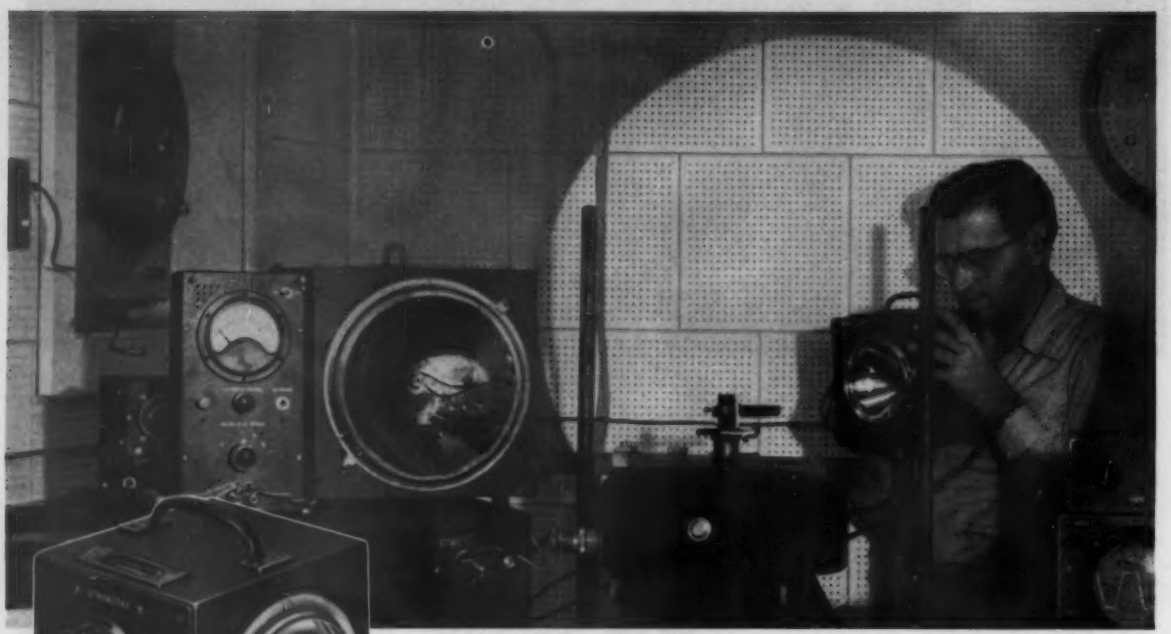
Name & Title.....

Company.....

Address.....

For more facts circle 572 on Reply Card

How to See the Effects of VIBRATION



Stroboscopic light used in conjunction with a shake table provides the detailed information that is needed to solve difficult vibration problems. Test facilities of this type at Fenwal, Inc., of Ashland, Massachusetts, are used to detect resonant nodes in aircraft overheat detectors.

The Strobotac, synchronized to the shake-table operating frequency, "stops" cyclic motion, thereby permitting visual detection of resonant conditions. When a permanent record is needed, a variable-speed 16-mm motion-picture camera can be fitted with a contactor to control the flashing rate of the higher-intensity Strobolux. With this combination, exact records of operation can be obtained at various frequencies and accelerations.

Type 631-BL STROBOTAC® . . . $170
Versatile, basic stroboscopic light source — flashing range direct reading from 60 to 14,400 rpm, and useful from 300 rpm to 100,000 rpm for slow-motion studies. One control adjusts flashing rate to desired value; dial readings accurate to ±1% over most of range. Operates from 115v a-c line.

Type 648-A STROBOLUX® . . . $300
An auxiliary white-light source with an intensity 100 times that of Strobotac. Flashing rate up to 6000 flashes per minute. Must be flashed from Strobotac. Can be used for single- or multiple-flash photography.

Type 1532-B STROBOLUME . . . $275
An auxiliary white-light source with an intensity 400 times that of Strobotac. Useful for studying motion at relatively slow speeds. Flashing rate up to 1,200 per minute, or up to 3,000 at reduced intensity. Must be flashed by Strobotac or other make-or-break mechanism. Can be used for single- or multiple-flash photography.

Shown is a developmental vane-axial blower undergoing mechanical resonance testing at Rotron Research Corporation, Woodstock, New York. This concern uses both the Strobotac and Strobolux in the design of small fans and blowers for cooling electronic equipment.

GENERAL RADIO COMPANY

WEST CONCORD, MASSACHUSETTS

FIRST Broadcast Station Crystal Oscillator 1922

NEW YORK, WOrth 4-2722 Ridgefield, WHitney 3-3140 | CHICAGO Oak Park Village 8-9400 | PHILADELPHIA Abington HAncock 4-7419 | WASHINGTON, D.C. Silver Spring JUniper 5-1088 | SAN FRANCISCO Los Altos WHitecliff 8-8233 | LOS ANGELES Los Angeles HOllywood 9-6201 | IN CANADA Toronto CHerry 6-2171

For more facts circle 573 on Reply Card

MOST ADVANCED

insulated curtain wall of its type

and it's brand new on Butler buildings

Here's a fellow that's literally making construction history. In one simple operation he's erecting a complete exterior wall, finished inside and out—fully insulated—and ready for use as installed.

This revolutionary advance in curtain wall construction is made possible with new Butler Monopanl. It is the first factory-fabricated, factory-insulated panel that is factory sized to fit a pre-engineered structural system . . . and it is exclusive on Butler buildings.

Today, even the largest Butler buildings can be enclosed in just days with handsome, slender—space-saving—curtain walls that permanently seal out weather and are equal in insulating ability to thick masonry.

Now, with new Monopanl, the Butler system of building is an even faster, better way to build . . . more than ever, the lowest-cost way to build well.

Call your nearby Butler Builder for full details. Ask him about Butler financing, too. He's listed in the Yellow Pages under "Buildings" or "Steel Buildings." Or write:

A Monopanl is literally a metal "plank" complete with decorative outer face, insulation and finished inner face. Complex configuration makes it the strongest panel of its type.

The unique double tongue-and-groove design creates strong panel-to-panel joints, permits push-together assembly. Vinyl gaskets seal out moisture permanently.

from a design by A. Francik and Associates, Architects

BUTLER

BUTLER MANUFACTURING COMPANY

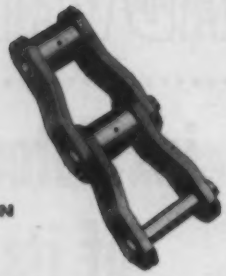
7529 East 13th Street, Kansas City 26, Missouri

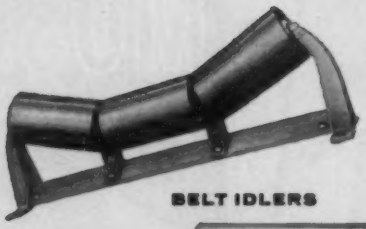
Manufacturers of Metal Buildings • Equipment for Farming Oil Production and Transportation, Outdoor Advertising • Contract Manufacturing

Sales offices in Los Angeles and Richmond, Calif. • Houston, Tex. • Birmingham, Ala. • Kansas City, Mo. • Minneapolis, Minn. • Chicago, Ill. • Detroit, Mich. Cleveland, Ohio • Pittsburgh, Pa. • New York City and Syracuse, N.Y. • Boston, Mass. Washington, D. C. • Burlington, Ontario, Canada

For more facts circle 574 on Reply Card

CHAIN





BELT IDLERS

Jeffrey equipment stocked for shipment

BUCKETS

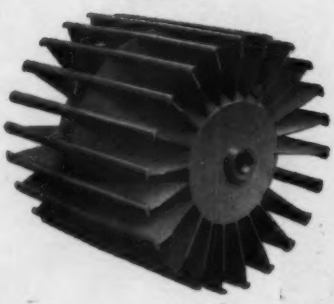
SPROCKETS

From factory or distributor stocks you can get fast service on a host of Jeffrey products...for elevating and conveying machinery and many industrial applications.

When replacing parts or modernizing machinery, it's wise to use genuine Jeffrey equipment. Highest manufacturing standards, based on years of experience, assure dependable performance. For service, call your Jeffrey distributor or write The Jeffrey Manufacturing Company, 905 North Fourth Street, Columbus 16, Ohio.

PULLEYS

PILLOW BLOCKS

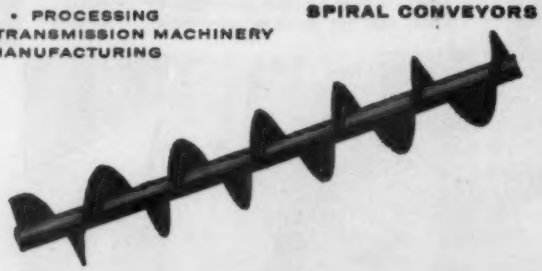


SPIRAL CONVEYORS

DISCHARGE VALVES

JEFFREY

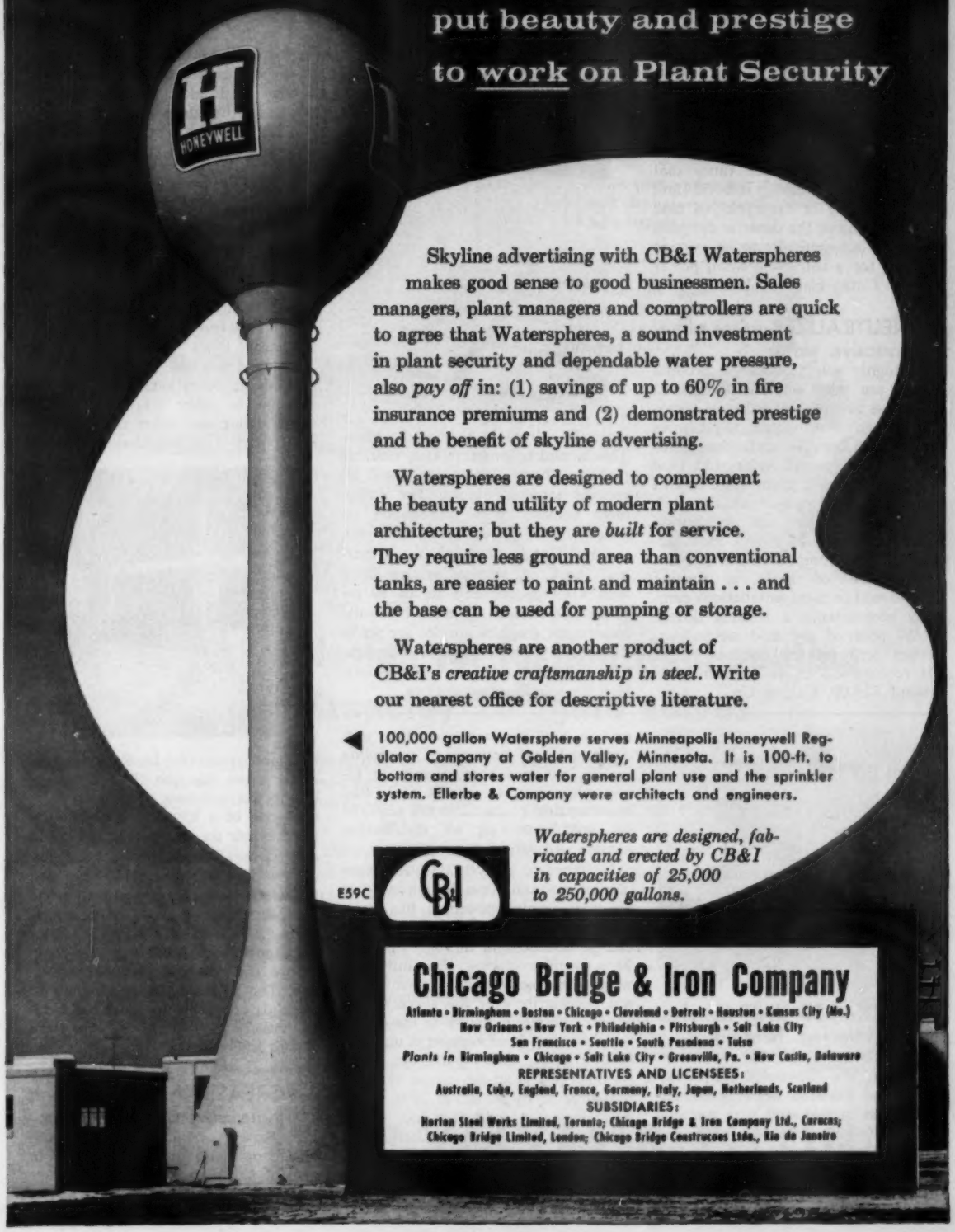
CONVEYING • PROCESSING
MINING EQUIPMENT...TRANSMISSION MACHINERY
CONTRACT MANUFACTURING



For more facts circle 575 on Reply Card

WATERSPHERES®

put beauty and prestige to work on Plant Security



Skyline advertising with CB&I Waterspheres makes good sense to good businessmen. Sales managers, plant managers and comptrollers are quick to agree that Waterspheres, a sound investment in plant security and dependable water pressure, also *pay off* in: (1) savings of up to 60% in fire insurance premiums and (2) demonstrated prestige and the benefit of skyline advertising.

Waterspheres are designed to complement the beauty and utility of modern plant architecture; but they are *built* for service. They require less ground area than conventional tanks, are easier to paint and maintain . . . and the base can be used for pumping or storage.

Waterspheres are another product of CB&I's *creative craftsmanship in steel.* Write our nearest office for descriptive literature.

◀ 100,000 gallon Watersphere serves Minneapolis Honeywell Regulator Company at Golden Valley, Minnesota. It is 100-ft. to bottom and stores water for general plant use and the sprinkler system. Ellerbe & Company were architects and engineers.

E59C

Waterspheres are designed, fabricated and erected by CB&I in capacities of 25,000 to 250,000 gallons.

Chicago Bridge & Iron Company

Atlanta • Birmingham • Boston • Chicago • Cleveland • Detroit • Houston • Kansas City (Mo.)
New Orleans • New York • Philadelphia • Pittsburgh • Salt Lake City
San Francisco • Seattle • South Pasadena • Tulsa
Plants in Birmingham • Chicago • Salt Lake City • Greenville, Pa. • New Castle, Delaware
REPRESENTATIVES AND LICENSEES:
Australia, Cuba, England, France, Germany, Italy, Japan, Netherlands, Scotland
SUBSIDIARIES:
Horton Steel Works Limited, Toronto; Chicago Bridge & Iron Company Ltd., Caracas;
Chicago Bridge Limited, London; Chicago Bridge Construcoes Ltda., Rio de Janeiro

NEW PRODUCTS AND PROCESSES summarized for your convenience

Edited by M. E. Heniken

Reader Service Cards on pages 209-210 make it easy to get further information on any of these products. Just circle the item numbers of the products you would like to know more about.

1—TIMER features time selection, visual indication

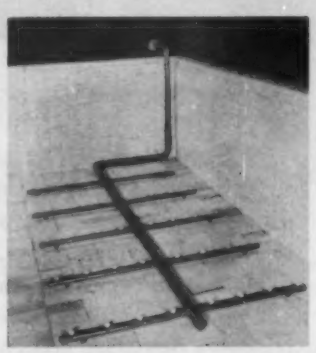
Since the dial of this 30-min synchronous motor-driven timer is marked off in minutes with half-minute graduations, the exact time is selected simply by rotating a bronze pointer to the timing cycle required. While in operation, the timer dial shows the full timing interval and time remaining in the cycle. In case of power failure the timer is designed to return automatically to its starting position for a full cycle when power returns. Cutler-Hammer Inc.

2—NEUTRALIZER raises pH of corrosive water

This highly soluble alkaline product is for use with solution feeders to neutralize or raise pH value of corrosive water. Formulated to dissolve rapidly and form a sterile feed solution, the compound helps stop blue or green staining sometimes caused by corrosion of copper plumbing. It does not crystallize out of solution during cold weather, says manufacturer, and is compounded to prevent precipitation of scale in feeding equipment.For most installations company recommends a starting dosage of 20 ppm of the acid neutralizer. Proper feed rate is obtained when pH reaches 7.2. A 40-lb drum costs around $25.00. Calgon Co.

4—STEAM JET AGITATOR circulates acid vertically

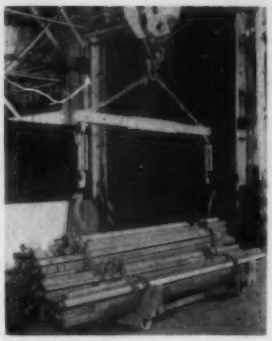
For batch pickling of sheets, coiled rods, wire etc., the E-4 Steam Jet Agitator is designed for efficient heating and uniform circulation of acid



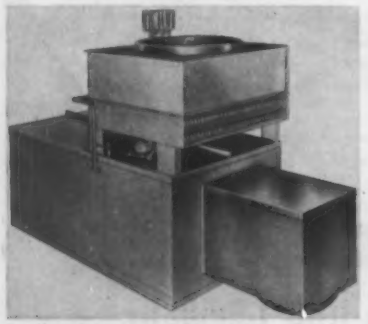
vertically through the work loads. This is said to promote fast, uniform pickling, shorter work cycles and increased tonnage output. The equipment consists of a tree-shaped arrangement of heavy walled lead piping, resistant to mechanical and thermal shock. A vertical section fitted with a flange connects to an 80 psi steam line outside the tank. Nocordal impervious graphite nozzles are set in the cross arms at spaced intervals. The agitators come in various sizes. Heil Process Equipment Corp.

5—CHAIN RELEASE permits safer load handling

For operations where conditions make it dangerous to unhook the load, the Acco Solenoid Chain Release is designed to permit safe release of tough-to-handle loads without assistance. Developed for use in steel mills for soaking-pit operations, it is also applicable in other jobs where bars, tubes, strips and other materials are transported with sling chains. The unit



is remote-controlled by the crane operator from his cab. By pushing a button, he activates the solenoids at each end of a spreader bar. This, in turn, expels the chain from its hooks and releases the load. Should the button be pushed accidentally, or power fail while the load is being transported, the load will not be released, company states. All loads must be on the floor with tension removed from the chain before the solenoids become operative. The solenoid device is available in single or double spreader bar models. American Chain Div., American Chain & Cable Co., Inc.



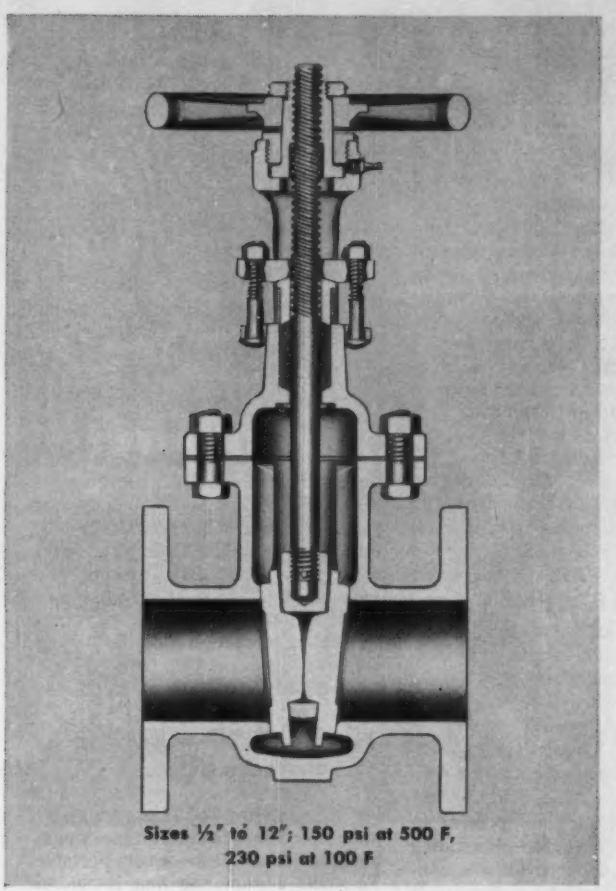
3—PACKAGED UNIT for air conditioning, heating

Particularly suitable for one-story structures, this air-cooled air conditioner and gas-fired heater combination comes in two sizes with nominal air conditioning capacities of 5 and 8 tons. The heating system provides 160,000 Btu-hr output. Roof mounted, it provides a year-around system offering economies in installation, operation and maintenance. The self-contained unit consists of a cooling system, gas-fired heating unit, air filters, blowers and controls. Only fuel and electrical connections are required for installation—an air distribution plenum and diffuser is supplied.

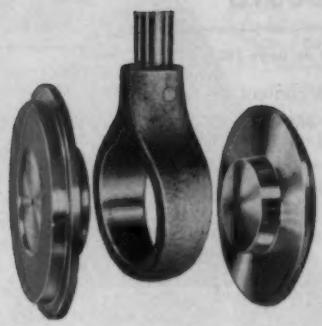
Designed to exploit full advantages of roof mounting (installation in other locations is also possible), this combination unit provides intake and discharge connections through the end. This permits placing the unit over weight-bearing building members—not necessarily over the space served—and running ductwork to the diffuser. Additional roof support is not normally required, it is pointed out. Compactness is also an advantage; the unit measures 55 by 92 in., is 74 in. high. The air-cooled condenser has a propeller type fan which discharges air vertically, so that its performance is not affected by wind velocity, company notes. Typhoon Air Conditioning Co., Div., Hupp Corp.

6—GREASE ADDITIVE gives more coverage per dollar

For greases and heavy oils, this MoS_2 dispersion ('dag' 208) is claimed to provide substantially greater coverage than finest commercially available molybdenum disulfide powder at no

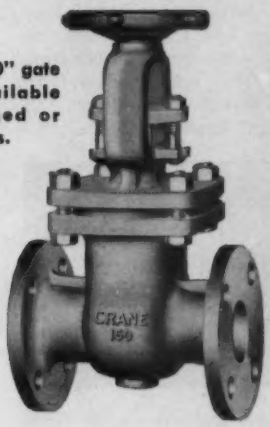


Sizes ½" to 12"; 150 psi at 500 F, 230 psi at 100 F



Crane split-wedge disc design. Identical disc halves assure uniform seating pressure.

"Craneloy 20" gate valve. Available with flanged or screwed ends.



Exclusive design for lasting tight seating in "Craneloy 20" gate valves

The simple, unique split-wedge disc construction in "Craneloy 20" gate valves is the key to smooth operation, tight shutoff and long seat life.

Identical disc halves, exclusive with Crane, mean that seating loads are transmitted equally to each half, assuring uniform pressure on the seating faces. No danger of buckling—there's no weak disc member as in conventional ball and socket disc construction. In opening, the first turn of the handwheel frees discs—even if the valve is closed hot and opened cold.

Special guide flanges on the discs, *another Crane extra*, prevent disc drag across the seat during operation . . . give you longer seat life. Discs are free to rotate to prevent seizing and galling.

All parts of the valve in contact with flow are "Craneloy 20," a high nickel, high chromium stainless steel cast in Crane's own foundries. Stuffing boxes are packed with tough, resilient, non-contaminating Teflon.

For complete information about all Crane stainless steel valves, see your Crane Representative.

Get complete specifications on "Craneloy 20" stainless steel valves. Ask your Crane Representative for Circular AD-2080, or write to address below.

CRANE® VALVES & FITTINGS

PIPE • PLUMBING • HEATING • AIR CONDITIONING

Since 1855—Crane Co., General Offices: Chicago 5, Illinois—Branches and Wholesalers Serving All Areas

For more facts circle 577 on Reply Card

NEW PRODUCTS

(Begins on page 152)

increase in solids content. In fact, says manufacturer, greater effectiveness can be obtained at lower solids content, extending range of applications to closer-tolerance mechanisms. Finer particles in the pre-wetted dispersion provide much greater hiding power, it is explained, and the ultimate result is more coverage per dollar. Acheson Colloids Co.

7—SEALANT TAPE seals, lubricates pipe joints

Chemically inert, Scotch Brand Pipe Sealant Tape 547 is announced for sealing and permanently lubricating pipe joints. This unfused film tape, available in 3- and 4-mil calipers, can be applied in seconds and conforms

to pipe threads and fittings, according to company. Made with a Teflon TFE fluorocarbon resin, it is reported to withstand processing temperatures from the liquid-oxygen range through that of super-heated steam, and to be unaffected by oil traces or other lubricants in the steam line. Although non-adhesive, the tap is sufficiently cohesive to stick to its own glossy surface. The tape is white and pliable, in 36-yd rolls, ¼- to 8-in. widths. Minnesota Mining and Mfg. Co.

8—RELIEF VALVE "tells on" high pressure

Compact size, variable relief pressure adjustment and continued indication of operation even after pressure has returned to normal, suggest the Demi Tattle-Tale for applications where it is important to know if pressure has opened the valve even momentarily. It features an indicating pin designed to pop out of the compact body the instant the valve opens. The red anodized pin remains in the out position until manually reset; it shows at a glance that the present pressure has been exceeded even after the condition subsides. The Demi Tattle-Tale has a pressure adjustment screw on the top of the bonnet and can be had for relief settings from 3 to 100 psi. It can be used in conjunction with micro-switches for additional signalling methods. These valves are available with NPT connections 1/16 to ½ in. George W. Dahl Co., Inc.

9—ROOF VENTILATORS are Fiberglas units

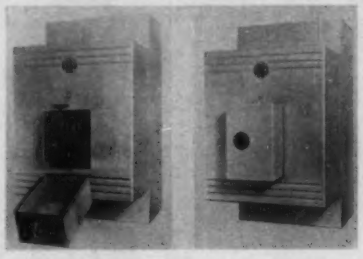
Fiber-Aire Ventilators are so silent you can't believe they're running, says manufacturer. Instead of acting as a sound chamber, the Fiberglas housing absorbs noise and vibration, it is pointed out. It is also claimed virtually indestructible and able to withstand severe impact, weather, temperature and most chemicals. It is sky blue in color, low in contour. Forty-four belt-drive models in the Fiber-Aire line offer capacities from 180 to 13,500 cfm. They incorporate stainless steel air flow guides. The Swartwout Co.

10—FLUORESCENT LAMP comes close to daylight

Available in most standard fluorescent and slimline sizes, the Koolorated is announced as a pure white lamp, the closest approach to natural outdoor daylight. According to manufacturer, the Koolorated Lamp blends a precise balance of all colors in the visible spectrum that are present in natural outdoor daylight—eliminating color distortion and providing a constant standard of most nearly perfect illumination possible for proper evaluation of colors and textures. The soft, natural light provided by this lamp is said to greatly reduce eyestrain, and tests are reported to indicate unusual life expectancy—16,000 to 18,000 user hours. Certified Electric Corp.

12—LOW VOLTAGE BREAKER is dust-proof unit

For NEMA 1A applications, this is a dustproof model of the U-Re-Lite, individually enclosed low-voltage power circuit breaker designed to offer



a "visible break" to provide a check on whether a breaker is connected or disconnected. The new model is similar to the general purpose U-Re-Lite, but has a gasketed air-tight front cover. The front cover opening permits check of breaker position indicator, while side opening allows check of breaker contact position. Both openings have transparent covers. I-T-E Circuit Breaker Co.

13—WELDING MACHINE for aluminum pipe

This automatic circumferential welding machine for butt welding aluminum pipe comes in several sizes weighing from 40 to 50 lb—easily portable. To make a joint, the unit is held in position by a strap clamp and the welding gun and cable drum gear travel around the horizontal axis of the pipe. With this simplified equipment, a 4½-in diam standard pipe can be butt-welded in less than 1 min., manufacturer states, and without any "programming." Aluminum Ltd.

11—SPRAY EQUIPMENT paints efficiently, with less mist

Improved spraying quality with less labor is announced for Chemtronic, a compact, portable paint spray unit. For transportation of paint materials Chemtronic utilizes, instead of compressed air, a hydrocarbon compound

(Chemosene) atomized by an electronic heating unit within the unit. Besides performing noislessly, Chemtronic gives astonishingly high lacquer yield, says manufacturer, and with less spray mist.

Both paint and gas are heated, permitting higher concentration of solids in the material and allowing more paint to be sprayed without snagging. Chemtronic is claimed to achieve in one operation, a finish equal in thickness and surface to two or three coats applied by other spraying processes. This equipment is also said to obviate weather influence. Atomizing gas contains no liquid, and even after a temperature drop due to expansion, with Chemtronic paint reaches the spraying surface relatively warm. Cellulose lacquers can be sprayed in high relative humidity without blooming,

Inset:
On injump transfer drives, 40 feet of DIAMOND Roller Chain takes chips to pre-press operation.

Two DIAMOND Roller Chains, each approximately 110 feet long, conveying trays on Caul Conveyor built by Continental Gin Co.

DIAMOND
ROLLER CHAIN
helps speed Formica Flakeboard production

On American Cyanamid's well-planned production line in the new Formica flakeboard plant at Farmville, N. C., DIAMOND Roller Chain helps speed production of 2,000 square feet of ¾" board an hour . . . 40 million square feet a year.

Wherever durability, efficiency and low-cost operation are essential, you can depend on DIAMOND Chains. DIAMOND Roller Chains . . . for power transfer, precision timing, conveying and numerous applications . . . are performance proven!

DIAMOND meets difficult conditions of load, shock, fatigue and abrasion with a minimum of maintenance, reduced equipment downtime, long operating life and highest quality service.

Your DIAMOND Distributor has all types and sizes of standard Roller Chain in stock. Bronze and stainless steel are available for corrosive conditions. Look under "Chains" or "Chains, Roller" in the Telephone Directory *Yellow Pages* . . . or write to Diamond Chain Company for complete catalog, and name of your nearest Distributor.

DIAMOND CHAIN COMPANY, INC.
A Subsidiary of American Steel Foundries
Dept. 614, 402 Kentucky Avenue, Indianapolis 7, Indiana
Offices and Distributors in All Principal Cities

Find Your Nearest Distributor in The 'Yellow Pages'

DIAMOND ROLLER CHAINS

For more facts circle 578 on Reply Card

NEW PRODUCTS

(Begins on page 152)

it is stated, and many lacquers formerly considered impossible to spray can be handled. The Lofstrand Co.

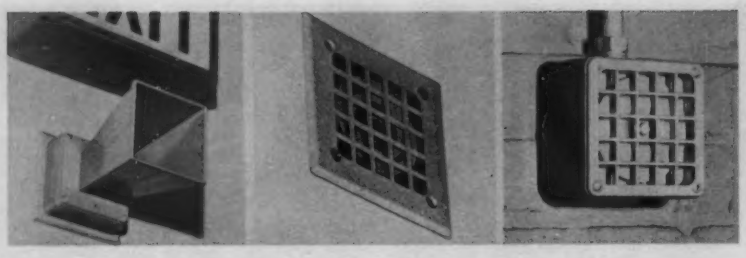
14—HYDRAULIC FLUID is fire resistant emulsion

Sunsafe, a water-in-oil emulsion type hydraulic fluid is said to possess, in addition to fire-resistant properties, a high viscosity index (130) with excellent film strength at high temperatures, good thermal stability even when subjected to operating temperatures of 150 F for prolonged periods, and excellent anti-wear and anti-rust characteristics. It may be used in hydraulic systems where a fire-resistant type fluid is considered desirable or necessary, at pressure to 2000 psi and operating temperatures to 150 F. It may be used with centrifugal, rotary and reciprocating, or piston type hydraulic pumps incorporating plain or friction-type shaft bearings, except where manufacturer's instructions indicate otherwise. Sun Oil Co.

15—CONVEYOR BELTING uses no troughing idlers

Monobelt has a flange edge which makes the use of troughing idlers unnecessary. Its design contributes to reduced initial conveyor cost and maintenance costs and increases belt life, according to manufacturer. The one-

piece belting is pre-tensioned to flex as it passes around the pulleys, allowing faster belt speeds. This belting is claimed to deliver 40 to 200 per cent more material than a conventional troughed belt of the same width traveling at the same speed. With an increased cross-section area, higher angles of incline are possible because Monobelt traps the material on three sides. Available in widths to 48 in., Monobelt comes in common industrial grades, types and classes of belting—including oil-, heat- and flame-resistant types, canners belting, grades suited for handling abrasives. Flange sizes range from 1 to 3 in. The MonoBelting Corp.



16—ADAPTABLE HORN simplifies alarm system installation

Based on a modular design concept, the ultra-flexible Vibratone provides a choice of three styles, each with six mounting variations. Interchangeable modular accessories let one basic unit meet audible signal needs of production areas, office, cafeteria, corridors. The compact, basic horn can fit into a 4-in. square electrical outlet box, as illustrated at right. Each horn has an individual volume control—sound can be adjusted from a buzz to an attention-commanding 101-103 decibels. Vibratones, although competitively priced, are engineered for systems involving hours of continuous operation, it is announced, and the horn has low current consumption.

The three horn models include a grille type for offices and general areas; a single projector style (shown in the photo at left) where the alarm must be megaphoned at longer range; and double projector for two-directional distribution. Each model can be mounted six ways. For regular interior surface mounting on wall, ceiling or post, where electrical conduit is exposed, you can mount the horn unit on a 4-in. outlet box. If the box is plastered in, another mounting variation provides a semi-flush appearance with only 1¼ in. of projecting grille. For completely flush mounting, the basic unit may be placed inside a back box plastered into the wall, as shown in the center picture—an installation utilizing a flat-type grille flush to the wall. By itself, the basic unit can be positioned on a control panel, inside a cabinet or in any other application where no rear housing is required. Although engineered for a 4-in. outlet box, the horn can be adapted to mount on existing facilities. Federal Sign and Signal Corp.

17—CHAIN TESTER is electronically controlled

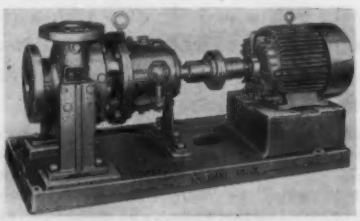
This electronically-controlled instrument is designed to test chain and cable up to 30 ft at a time, as well as couplings, links, rods, rings, etc. The test load is pre-set by a dial on an electronic console. When the test load point is reached, the test is automatically concluded. From start to finish, a test takes about 5 min, company says, and considerably less when repeated on pieces of same approximate size. Tester is available in three maximum capacities: 50,000, 100,000 and 250,000 lb. Equipment includes tail stock dolly, power piston and load cell assembly, hydraulic power unit, and electronic control console. Fairbanks, Morse & Co.

18—FIRE RESISTANT PAINT snuffs out the flame

Fire-Poof chemically snuffs out flame and eliminates smoke, according to manufacturer of this fire-resistant paint. Also, when applied to metal surfaces, Fire-Poof serves to prevent rust and corrosion and eliminate "sweating" on pipes. It comes in an assortment of colors, in exterior and interior finishes. Nor-Chem Products.

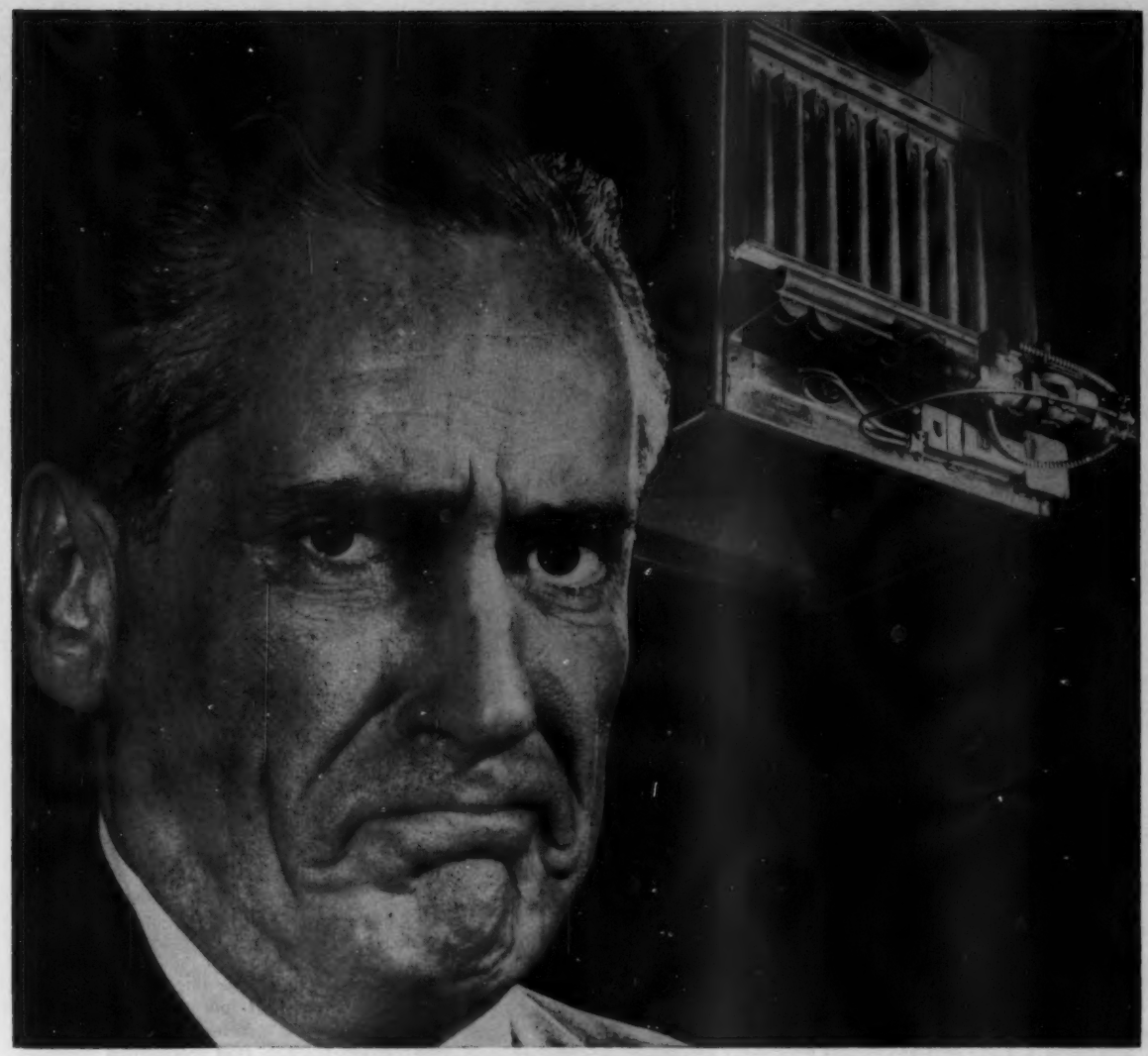
19—PROCESS PUMPS for refineries, petro-chemical plants

These pumps are designed to meet requirements of refinery and allied industry applications, as well as hot water circulating applications. Figure 3775, an enclosed impeller type centrifugal pump (illustrated) is a center line mount unit with vertically split casing, water cooled seal chamber and bearing housing, and internal mechanical seal. The pump's back pull-out design facilitates maintenance. By using a spacer coupling,



complete removal of rotating parts is possible without disturbing pipe connections or driver. Built in 11 sizes, Figure 3775 can pump up to 850 gpm. Maximum working temperature is 600 F, maximum working pressure, 550 lb.

Figure 3675, a close coupled ver-



TOUGH BUYERS

DEMAND REZNOR STAINLESS STEEL DUCT FURNACES

BECAUSE THE HEAT EXCHANGER AND BURNERS CANNOT CORRODE!

The tough buyer looks to the future. He thinks about possible trouble-makers like corrosion in air conditioning, make-up or ventilation air systems. That's why so many of you insist on Reznor *stainless steel* duct furnaces: they *can't* corrode!

LOWER FUEL COSTS, TOO—You'll appreciate Reznor "extras," like the gas modulating valve that keeps heat even and fuel costs down. As discharge temperatures rise, the valve cuts gas input to 20% of rated capacity, then shuts off the supply completely.

CHECK THE "TOUGH BUYERS' LINE" You can select Reznor duct furnaces in capacities up to 300,000 Btu. Use them in multiples for greater heat requirements. Buy matching Reznor blowers.

For catalog and information, phone your nearby Reznor distributor, or write Reznor Manufacturing Company, Dept. 91B, Mercer, Pa.

For more facts circle 579 on Reply Card

THE HEATING WORLD IS FULL OF TOUGH BUYERS; THAT'S WHY REZNOR IS THE WORLD'S LARGEST SELLING DIRECT-FIRED HEATER!

REZNOR HEATERS

"THE TOUGH BUYERS' LINE"

CONTROL AIR POLLUTION

Profit from public demand for cleaner air

FREE brochure tells you how!

Now learn how you can clean up combustible pollutants, fumes, and odors from your processes. An Oxycat System can be engineered to your special requirements.

Catalytic oxidation installations often lead to actual fuel savings. For many applications they are more economical than flame incinerators . . . more efficient than water scrubbers.

Oxycat Systems are the most effective air pollution control and waste heat recovery method ever developed. Discover how profitably they can work for you in drying ovens, furnaces, and chemical and food processes.

An economical Oxycat System can be your answer to rising public, editorial and medical demands for cleaner air and anti-pollution legislative controls on industry! Improved community relations pay off. Investigate—send today for brochure with facts and figures on typical installations!

STOP DEADLY EXHAUST FUMES

Oxy-Catalyst also manufactures an economical exhaust purifier to stop engine fumes from all type fuels. For use on fork trucks, stationary engines, power sweepers, all automotive equipment used in confined areas! Send for free brochure with full facts.

OXY-CATALYST, INC. Wayne 3, Pa., U.S.A.

Catalysts for fume and odor elimination, air pollution control, and waste heat recovery

Please send me your free brochure(s) on:

☐ Oxycat Systems to control air pollution, recover waste heat

☐ Oxy-Catalyst Exhaust Purifiers to stop deadly engine fumes

Name_____

Address_____

Firm_____

City_____ Zone_____ State_____

For more facts circle 580 on Reply Card

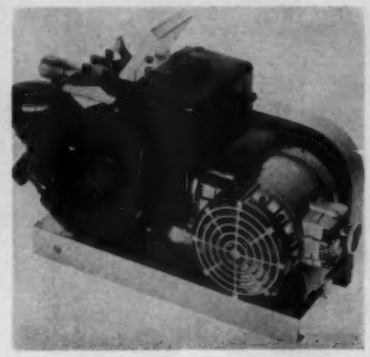
NEW PRODUCTS

(Begins on page 152)

sion of Figure 3775 with liquid end bolted to the flange faced motor and rotating parts assembled on the motor shaft extension, also comes in 11 sizes and has the same rating. Its maximum temperature is 275 F, working pressure, 275 lb. Both pumps have carbon steel casings, iron or bronze trim. Goulds Pumps, Inc.

20—OIL-LESS COMPRESSOR is gasoline engine driven

Extremely compact (18½ in. long), this air compressor weighs only 56 lb and is designed to deliver oil-free air up to 90 psi continuously. It is driven by a four-cycle, air-cooled gasoline engine with recoil starter, exhaust valve rotator and oil bath



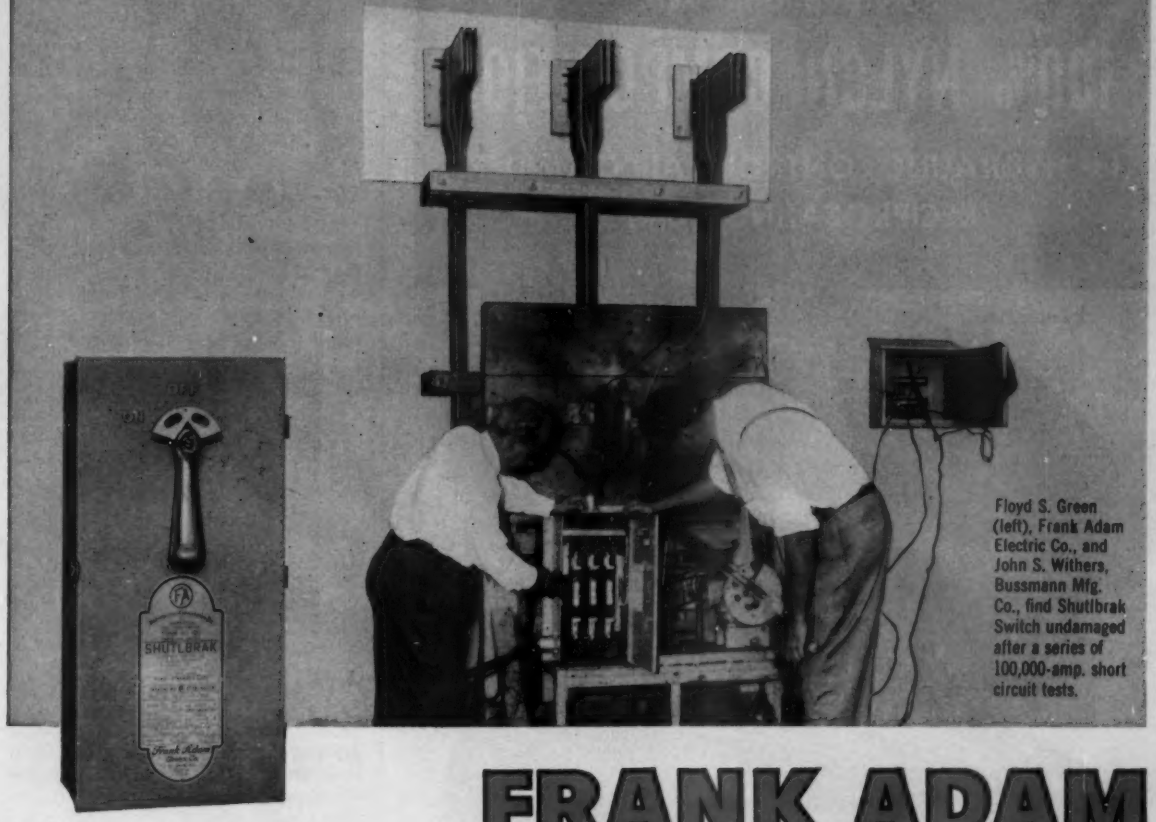
air cleaner. The engine also contains a three-quart fuel tank. The air compressor is a belt-driven twin-cylinder, single-stage unit containing features incorporated in company's motor compressors, including a belt guard for safe operation. Applications include spraying paint and cleaning compounds, operating pneumatic tools for nailing, chipping and drilling, operating air jacks. Bell & Gossett Co.

To receive product data circle item numbers on the handy Reader Service Cards provided on pages 209-210.

21—FOUNTAIN JUNCTIONS for cooling casting dies

These water fountain junctions are designed for spot cooling and regular cooling applications in plastic molds, die casting dies and cores where space for drilling of conventional water lines is limited due to ejector pins, core slices, cores. The zinc junctions

UNDAMAGED AFTER BEING "CLOSED" ON 100,000-AMPERE SHORT CIRCUIT!



Floyd S. Green (left), Frank Adam Electric Co., and John S. Withers, Bussmann Mfg. Co., find Shutlbrak Switch undamaged after a series of 100,000-amp. short circuit tests.

FRANK ADAM SHUTLBRAK SWITCHES

(SHUTTLE BREAK)

TYPICAL TESTS MADE WITH Ⓕ 3-POLE SHUTLBRAK SWITCHES

Switch Capacity	Fuse Type
100-amp. 250-v. Same switch	KTN Limitron LPN Low Peak
200-amp. 250-v. Same switch	KTN Limitron LPN Low Peak
100-amp. 600-v. Same switch	KTS Limitron LPS Low Peak
200-amp. 600-v. Same switch	KTS Limitron LPS Low Peak
400-amp. 250-v.	LPN Low Peak
600-amp. 250-v.	LPN Low Peak

In recent tests at Bussmann Manufacturing Company's test station, Frank Adam Shutlbrak Switches, equipped with Bussmann high interrupting type fuses, went through a series of tests with switches "closed" on a 100,000-amp. short circuit. **NOT A SINGLE BREAKDOWN OCCURRED!**

Here's a powerful demonstration of the safety and dependability insured by Frank Adam's famous Shutlbrak mechanism. Ⓕ Safety Switches give positive protection to both men and equipment against every hazard that might be caused by the tremendous overloads and shorts that can occur in any distribution and feeder circuit.

It costs no more for the extra *vital margin of safety* provided by Frank Adam Switches. Specify this better equipment. A new brochure is just off the press—*write for yours!*

See our catalog in SWEET'S

PRODUCERS COUNCIL

FRANK ADAM ELECTRIC COMPANY
P. O. BOX 357, MAIN P. O. · ST. LOUIS 66, MO.

busduct · panelboards · switchboards · service equipment · safety switches · load centers · Quikheter

For more facts circle 581 on Reply Card

DARCOVA PUMCUPS

now available with

100% NYLON COMPOSITION

for HYDRAULIC CONTROLS, AIR CYLINDERS, RECIPROCATING PUMPS

Darcova Pumcup

Darcova 45° Bevel Type Pumcup

DARLING Pumcups—long noted for unequalled efficiency and life in all kinds of cylinders—are now greatly exceeding their own performance records! The new 100% Nylon Composition, available *only* in Darcova Pumcups, does it!

Nylon Pumcups are made in sizes, types and textures exactly right for your particular equipment—ready *now* to give you unprecedented piston packing performance!

Write for helpful data Bulletin No. 5503.

DARLING VALVE & MANUFACTURING CO.

Williamsport 14, Pa.

DARCOVA THE ORIGINAL COMPOSITION CUP

TRADE MARK PUMCUPS

For more facts circle 582 on Reply Card

NEW PRODUCTS

(Begins on page 152)

are tapped for ¼-in. standard pipe nipple; each inlet and outlet is tapped for ⅛-in. standard pipe. A 14-in. length of ⅛ rigid brass tubing tube is furnished with each junction, threaded at one end to screw into the body. The junctions cost around $2.50 each. Advance Products Corp.

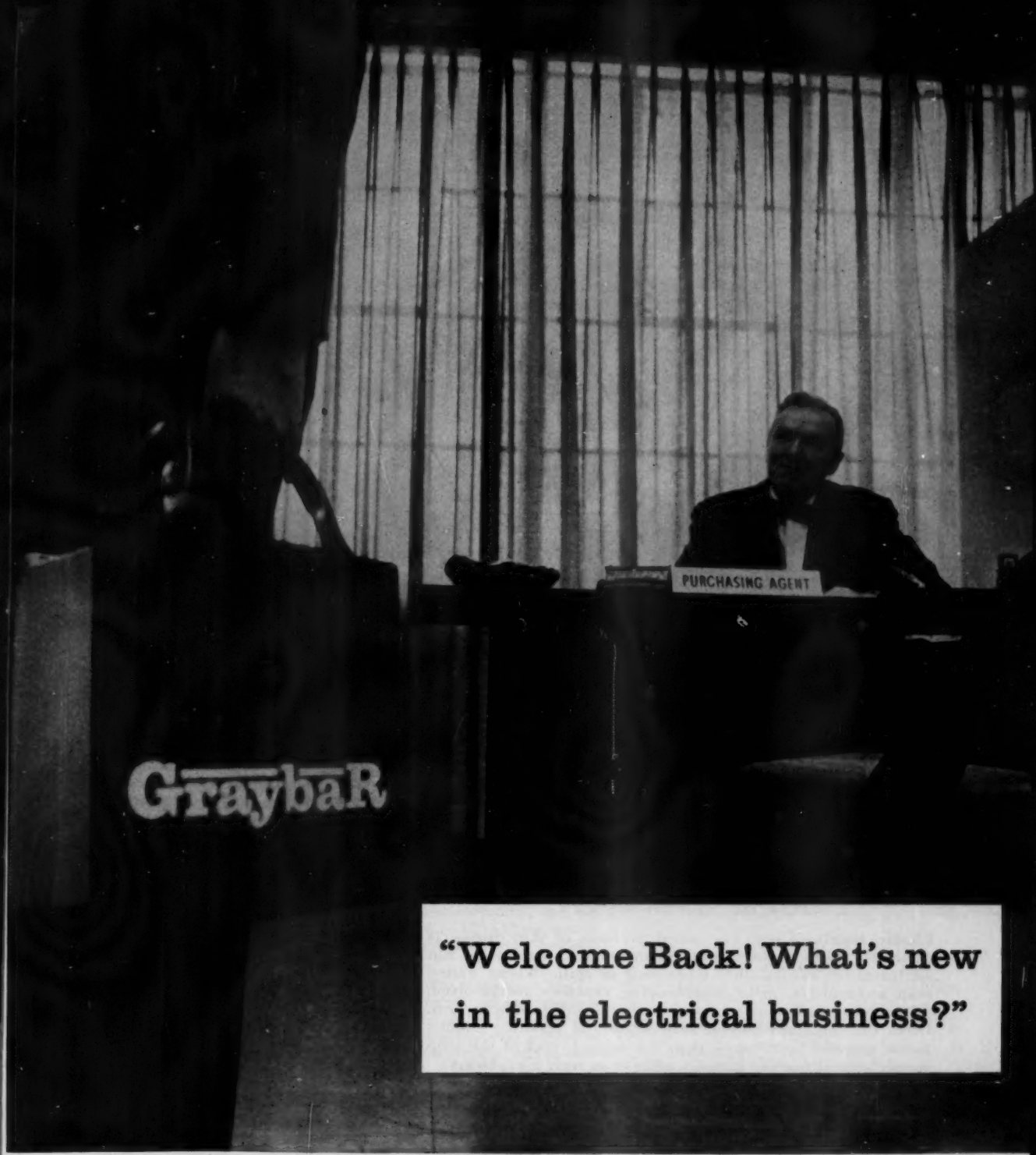
22—ALUMINUM DEVICE lifts heavier brick loads

Increased payloads of more than 1000 lb per load are reportedly achieved with this aluminum unit for handling brick and concrete. Greater payloads result from savings in weight afforded

by the aluminum construction, it is pointed out. The unit can be used on a lift truck (as shown) or separately suspended from a crane. Pallets aren't required with it, because a hydraulic gripping device holds the first tier, thus forming a platform for the second tier. Except for the A-frame which consists of two extruded channels of Alloy 6061-T6, all structural members are aluminum plate and heavy gage sheet of Alloy 5083, a high strength, weldable alloy developed by Kaiser Aluminum. Construction is both welded and bolted. Schmidgall Mfg. Co.

23—WELDING, CUTTING SET for light, medium duty

With the moderately priced Aircomite, you can weld steel up to ⅜-in. thick, cut up to 1-in. steel plate, braze and hardface. For light and medium duty industrial service, the outfit includes oxygen and acetylene regulators, welding torch with three tips, cutting attachment and tip, pressure mixer with gas sealing rings, welding goggles, 12½ ft of Neoprene-lined twin hose with connections, spark lighter, all-purpose wrench, and instruction booklet all in a metal carrying case. The oxygen regulator has a 60-psi working



"Welcome Back! What's new in the electrical business?"

Whatever is new, if it is right for your plant, your Graybar man recommends it . . . and knows how to put it to work . . . motors, controls, power distribution equipment, wiring or lighting supplies.

Objective *recommendations* and able, point-of-use *help* on anything electrical are available to you*. For both, call Graybar today! 93

*or your electrical contractor.

GraybaR

ELECTRIC COMPANY, INC.

Everything Electrical GraybaR ELECTRIC COMPANY

420 LEXINGTON AVENUE, NEW YORK 17, N. Y. • OFFICES IN OVER 130 PRINCIPAL CITIES

For more facts circle 583 on Reply Card

SURVEY DISCLOSES INDUSTRY'S NO. 3 SKIN HYGIENE PROBLEM: WASTE SOAP

Here's The Answer To It From SBS

The most difficult three industrial skin hygiene problems, as rated by 2,177 major plants recently surveyed, are:

1. *SKIN DISEASE*
2. *REMOVAL OF TOUGH SOILS*
3. *WASTE OF SOAPS*

Closely associated with the actual problem of skin disease is the costly waste of soaps in *all* plant areas. Liquid soaps run off hands too easily, other types melt or spill. Where wasted soap accumulates, extra housekeeping expenses are involved, sub-sanitary conditions exist and worker dissatisfaction mounts. Often the combined cost of soap waste and resulting maintenance can add up to more than the original cost of the soap supply. Small wonder industry rates it as such a problem!

What's the answer to it? Ask an SBS representative to show you "Operation Pinpoint", 10 minute sound slide digest of the national survey, and you'll see how a *planned corrective program* can solve all these skin hygiene problems. Since SBS produces a *complete range of cleansers*, he can suggest the right cleanser for each job. For the safest, savingest answer to skin disease, tough soils, and soap waste, write today . . . Dept.3H.

the washword of industry

SBS sugar beet products co.

SAGINAW, MICH. • Los Angeles, Calif. • Newark, N.J

CANADA: Chemical By-Products, Ltd., Toronto, Ontario

For more facts circle 584 on Reply Card

NEW PRODUCTS

(Begins on page 152)

pressure gage, and a 4000-psi high pressure gage with silver soldered bourdon tube connections. On the acetylene regulator, a 30-psi and a 400-psi gage are used. Additional cutting tips and auxiliary equipment for special jobs are available for use with this. Air Reduction Sales Co., Div., Air Reduction Co., Inc.

24—METER monitors and measures the noise hazards

Weighing only 12 oz, the M-S-A Noise Survey Meter is designed for rapid, multi-location measurement of sound levels to establish noise contour "maps" in industrial plants. Complete analysis can be achieved when this meter is

used in conjunction with manufacturer's Soundscope, an instrument which can measure energy distribution of sound within a narrow frequency band. The meter can be used ahead of the Soundscope to locate areas requiring detailed study; or behind the Soundscope to monitor noise levels in areas where frequency characteristics have been determined.

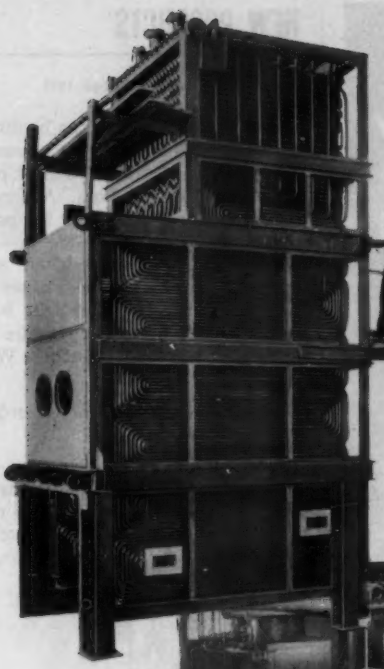
In operation, the meter is pointed toward the noise source, energized by power from a small mercury battery, and adjusted to an "on-scale" reading by a thumb-wheel attenuator. Sound pressure levels can be read in the range of 75 to 140 dec. Two models will be offered. The first, an industrial hygiene model, is designed with frequency response characteristics based on hearing damage criteria. The second is for use in noise reduction studies and acoustical engineering surveys. Mine Safety Appliances Co.

25—LEVEL SWITCH works in variety of fluids

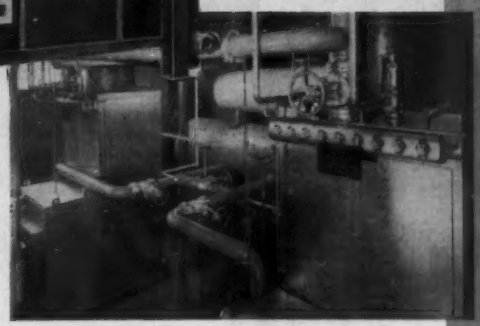
This explosion proof, hermetically sealed, low- (or high-) level warning switch is designed for use in almost any liquid. According to manufacturer, the switch cannot be affected by contaminants in the fluid, or by rolling

In new plants large and small...

The C-E high temperature water boiler offers savings of 10 to 20%



Shop-assembly view showing steel frame and pressure parts for 25-million Btu unit prior to installation of refractory, insulation block, and welded gastight casing.



Compactness of C-E HCC Boilers is demonstrated in this view of two 10-million Btu units installed at a new Michigan high school.

Representative list of C-E HCC Boilers in service, under construction, or on order

	No. of Units	Normal Output ea.—Btu/Hr. (millions)	How Fired
A. E. Smith High School Riverview, Michigan	2	10	Oil
J. Bishop & Co. Malvern, Pa.	1	12	Oil
Colorado State College Greeley, Colo.	1	60	Oil—Nat. Gas
Cross Company, The Frazer, Michigan	2	12	Nat. Gas—Oil—
Defense Construction Ltd. Camp Gagetown, N. B., Canada	3	70	Pulv. Coal Gas
Erie Mining Company Aurora, Minn.	2	65	Stokers—Oil or Gas
Convair Astronautics Div. General Dynamics Corp. San Diego, Calif.	2	30	Oil—Nat. Gas
General Motors Overseas Santos, Brazil	1	12	Oil
Hillcrest Medical Center Tulsa, Oklahoma	1	80	Nat. Gas
Marquardt Aircraft Co. Ogden, Utah	2	12	Oil—Nat. Gas
Michigan State University Oakland, Michigan	1	12	Oil—Nat. Gas
New Florida State Prison Raiford, Florida	2	30	Oil—Nat. Gas
North Carolina Wesleyan College Rocky Mount, N. C.	2	18	Oil—Nat. Gas
U. S. Air Force Academy Colorado Springs, Colorado	3 2	100 30	Oil—Nat. Gas
U. S. AIR FORCE:			
Clinton County Air Force Base Wilmington, Ohio	1	16	Stoker
Dover Air Force Base Dover, Delaware	3	56	Oil—(Fut. Coal)
Forbes Air Force Base Topeka, Kansas	3	42	Oil—Nat. Gas (Fut. Coal)
Grand Forks Air Force Base Grand Forks, North Dakota	2	25	Stokers—Oil
McGuire Air Force Base Wrightstown, N. J.	4	50	Stokers
Minot Air Force Base Minot, North Dakota	2	25	Stokers—Oil
Plattsburgh Air Force Base Plattsburgh, N. Y.	2	50	Oil
Portsmouth Air Force Base Portsmouth, N. H.	2	110	Oil—Nat. Gas (Fut. Coal)
Wright-Patterson Air Force Base, Dayton, Ohio	1	30	Stoker
Wuthsmith Air Force Base Oscoda, Michigan	2	25	Stokers
Air Force Base Torrejon, Spain	3	43	Oil
U. S. Navy Auxiliary Air Station Fallon, Nevada	2	15	Oil

The list at right points up the versatility and widespread acceptance of Combustion Engineering's HCC boiler. For industrials, schools, institutional use, military bases – wherever there is extensive space to be heated – C-E high temperature water has a place.

Featuring the same principle applied by Combustion in many of its large utility boilers, the C-E LaMont Controlled Circulation Hot Water Boiler offers a compact and effective arrangement of heating surfaces. This design gives precision temperature control, and, dependent upon local conditions, the HCC can save 10 to 20 per cent in maintenance and operating costs – a significant factor when considering a heat source.

Available in a wide capacity range – from 10 to 300-million Btu's – these boilers operate at water pressures up to 500 psi and temperatures to 470 F or higher. The smaller capacity HCC's are completely shop-assembled, while the intermediate and large units are shipped in varying stages of assembly. This C-E practice greatly reduces erection costs.

If you are in the market for boilers, either for space heating or process requirements, it may prove greatly to your advantage to investigate C-E high temperature water as your heat source.

Because individual needs vary, *both* steam and hot water have their applications. Combustion Engineering can furnish either, and our engineers are exceptionally qualified to discuss *impartially* with you or your consultants the method most suitable for your situation.

Write for further details on Combustion Engineering's High Temperature Water Boilers.

COMBUSTION ENGINEERING

C-190A

Combustion Engineering Building, 200 Madison Avenue, New York 16, N. Y.

ALL TYPES OF STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT; NUCLEAR REACTORS; PAPER MILL EQUIPMENT; PULVERIZERS; FLASH DRYING SYSTEMS; PRESSURE VESSELS; SOIL PIPE

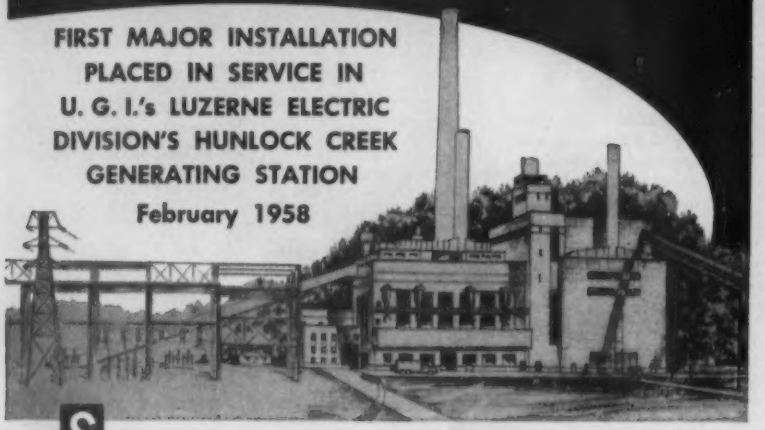
For more facts circle 585 on Reply Card

GTC PROVED RELIABILITY

IN-PLANT COMMUNICATION SYSTEM

FIRST MAJOR INSTALLATION PLACED IN SERVICE IN U. G. I.'s LUZERNE ELECTRIC DIVISION'S HUNLOCK CREEK GENERATING STATION

February 1958



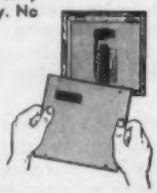
Since that time, the GTC system delivered constant, uninterrupted service. New plant unit will include extension.

This installation, as well as thousands of GTC units that have been installed in power stations and industrial plants throughout the United States since, have definitely established the superiority and reliability of GTC in industrial voice communications.

Features contributing to GTC's acceptance and reliability are:

1. Provides swift and sure voice communication even in adverse environmental conditions, such as extremes of temperature and noise.

2. All amplifiers are "plug-in" contributing greatly to ease of installation and maintainability. No central equipment is required.



3. Long-life transistors and rugged, industrial type components are used throughout. No vacuum tubes or "entertainment" type components are employed.

4. Inconvenience and expense of vacuum tube replacement is eliminated.

5. Design allows expansion of system from "very small" to "very large" by simple addition of units where required.

6. Ultra simple wiring plan (no shielded cables) and unitized equipment with integral terminal facilities make for easy low cost installation.

*Gai-Tronics Transistorized Communications is an effective, economical industrial communication system designed to provide swift and sure voice communications regardless of distance or surrounding noise conditions.

GAI-TRONICS CORPORATION
Dept. C
READING, PENNA.

A SUBSIDIARY OF GILBERT ASSOCIATES, INC.
ENGINEERS AND CONSULTANTS

GTC is extremely flexible in application. Write today for a copy of our completely illustrated, descriptive booklet and name of nearest representative.

For more facts circle 586 on Reply Card

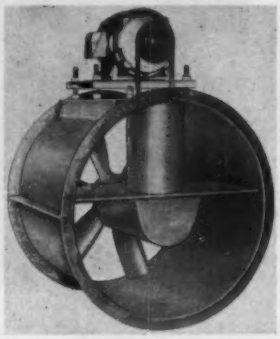
NEW PRODUCTS

(Begins on page 152)

or pitching motions. It can be installed to warning lights and/or automatic switching mechanisms to start pumps or open auxiliary lines. A time lag mechanism is provided to prevent tripping even when upside down for less than 3 sec. The switch weighs less than 16 oz, operates on any electrical system from flashlight battery to 300 v at 5 amp, temperature from −65 to 250 F. Acme Machine Works.

26—DUCT FANS, of fiberglass, resist corrosion

These all-fiberglass belt-drive duct fans, which in many applications offer resistance to corrosion equal to or exceeding that of all-stainless steel or all-Monel units, are being introduced



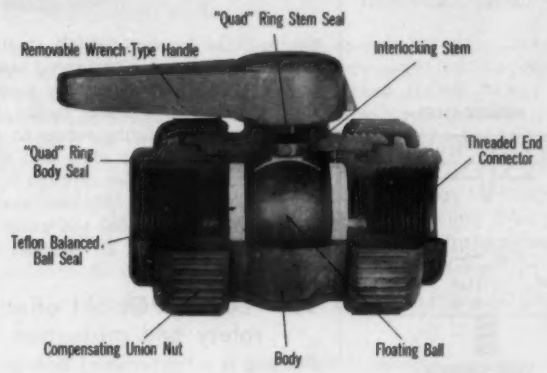
at substantially lower cost, according to manufacturer. Propeller, duct section, drive housing and bearing cover on these fans are fiberglass; drive shaft and hardware are stainless steel. In design and performance this new line is identical to company's standard belt-drive duct fans and offers the same features, including variable pitch drives permitting quick adjustment of fan speed, noise and air delivery. Fiberglass models come in 20-, 24-, and 28-in. diameters. Bulletin A-116 gives performance data. Hartzell Propeller Fan Co.

27—TINY LUBE SYSTEM for production machinery

The Micro-Measure System, a miniaturized injector system for automatic lubrication of production machinery, is designed to pre-measure and inject fluid lubricants to "millionths of an ounce" in automatic cycles as often as every minute. An automatically controlled, air-operated pump supplies lubricant to small, economical injectors with micro-meter adjustment, at a predetermined rate, in quantities as small as 1/135 drop. The system is

WHY COMPROMISE WITH CORROSION?

CHEMTROL PLASTIC VALVES give you these advantages--



— *Complete range of corrosion resistance*
— *Greatest efficiency in fluid control systems*
— *Economy . . . initial and long term because Chemtrol specializes in plastic valve design exclusively!*

CHEMTROL BALL VALVES engineered for corrosion-service

- *Full flow . . . no pressure drop*
- *Continuous take-up on seat seals*
- *Self-lubricating*
- *Quick disassembly*
- *Quarter-turn opening — positive closing*
- *Temperature resistance up to 250° F.*

OTHER CHEMTROL PLASTIC VALVES
Chem-Check, Chem-Cock
Micro-Needle and Micro-Flow Globe Valves
¼-in. I.P.S. to 4-in. I.P.S.

Available in basic plastic materials:
PVC, Kralastic*, polypropylene, Penton**
*Naugatuck Chemical Co. **Hercules Powder Co.

chemtrol®

CHEMTROL
10872 Stanford Ave. Lynwood, California

Distributor stocks nationally.
Complete research and development facilities available to you for your specific corrosion problems. Send for recommendations and "plastic chips" for solution testing. Write Chemtrol: Dept. PE859 for Engineering Handbook 159 on designing plastic piping systems.

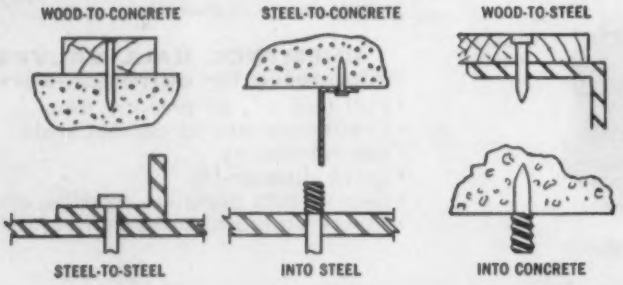
For more facts circle 587 on Reply Card

ONLY RAMSET

"covers all the bases in powder-actuated fastening"

This statement has been made by hundreds of contractors, architects, electricians, plumbers, maintenance men, supervisors, foremen and others over the past ten years! Whatever the job, if it involves fastening into concrete or steel Ramset can do it more easily, efficiently, and with a lower in-place fastener cost.

Threaded studs, drive pins, eye pins—over 100 specialized fasteners team with ten types of powder charges to assure you of just the right holding power for each job. It will pay you to get more details. Your Ramset dealer is listed in the Yellow Pages under tools . . . call him today!



In addition to powder-actuated fastening, the versatile Ramset System includes Shure-Set® hammer-in tools for light fastening, and Ringblaster® heavy-duty kiln gun.

Ramset Fastening System

WINCHESTER-WESTERN DIV. • OLIN MATHIESON CHEMICAL CORPORATION
12133-H BEREA ROAD • CLEVELAND, OHIO

For more Facts circle 588 on Reply Card

NEW PRODUCTS

(Begins on page 152)

said to maintain a constant, uniform oil film on all bearing surfaces with no overflow or dripping. Bulletin 816 describes it. Lincoln Engineering Co.

28—FLUORESCENT UNITS provide improved lighting

While designed primarily for classroom lighting, the Versateer is also suited for many other lighting applications. It blends with a variety of architectural treatments and features simplified, all-steel construction. Greater diffusion and better lamp shielding are also announced for the Versateer and within cost limitations for economy fixtures. The fixture is available for surface or suspension mounting, in two- or four-lamp arrangement, with 35-by-25 or 45-by-45 deg lamp shielding. Bulletins AD 6888 and 6892 provide specifications and selection data. Benjamin Electric Mfg. Co.

29—PLASTIC TUBE PILOTS speed equipment assembly

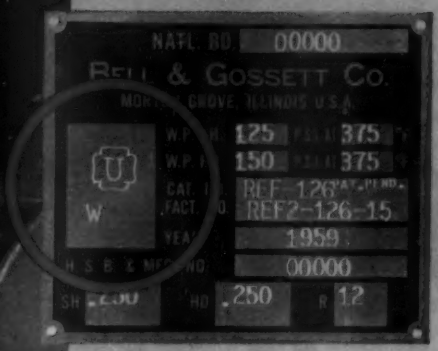
Light, easy-to-handle Guide-Rite Tube Pilots are designed for use with heat exchanger and boiler tubes ranging from ⅜ to 1 in. OD. According to manufacturer, these plastic pilots do

the work of heavier models at about a tenth of the cost. They speed assembly of tubular equipment by piloting tubes through tube sheets, baffles, and support plates. Piloting serves to prevent damage to tube ends and eliminate need to fish tubes through holes. Pilots have a spring pressure feature to hold them in place, yet make removal easy. Thomas C. Wilson, Inc.

30—FLOOR POLISH offers safety and protection

Fullstop is a light-colored floor polish designed for the utmost in floor safety, protection and beauty. It contains synthetic resins and plasticizers dispersed in water, and is said to create a much "slower floor" that is more scuff resistant and brilliant. A feature is noted ability to retain slip resistance with noticeable loss of gloss. Fullstop is also claimed to retain a good gloss under unusual traffic conditions, to have good leveling proper-

SYMBOL OF QUALITY



For heating or cooling liquids or gases, all B&G Heat Exchangers are built to A.S.M.E. Code requirements

B&G Heat Exchangers are not only engineered to top efficiency but are constructed to the uncompromising standards of quality and safety demanded by the A.S.M.E. Code.

With each B&G Exchanger, a Manufacturer's Data Report for Unfired Pressure Vessels, Form No. U-1, as required by the A.S.M.E. Code rules, is furnished. This form is signed by a qualified inspector, holding a National Board Commission, certifying that the construction conforms to the latest A.S.M.E. Code for unfired pressure vessels. The A.S.M.E. "U" symbol is stamped on each exchanger.

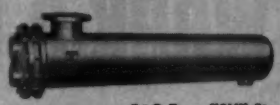
All facilities required for heat exchanger manufacture are available under one roof at B&G, where assembly line procedures permit building an inventory of stock items. Many of the machining, tooling and welding fixtures are especially designed by B&G. All welding procedures must satisfy A.S.M.E. standards...and all welding is spot X-rayed.

B&G Heat Exchangers are manufactured by methods which hold shell diameters exact and free of distortion. This permits tight fitting baffles with minimum liquid slippage and easy replacement of tube bundles if ever necessary.

Send for free brochure, "The A.S.M.E. Story."

B&G Evaporators and Condensers

B&G Lube Oil Cooler for Diesel Engine Service



B&G Type "SU" Steam-to-Water Heat Exchanger

B&G Type "WU" Water-to-Water Heat Exchanger

B&G Heat Exchangers are welded in specially designed fixtures by expert workmen.

BELL & GOSSETT
COMPANY
Dept. FV-53, Morton Grove, Illinois

Canadian Licensee: S. A. Armstrong Ltd., 1400 O'Connor Drive, Toronto 16, Ontario

For more facts circle 589 on Reply Card

WORK-O-MATIC DROP-BOTTOM BOX AND POSITIONING STAND

Partners in handling Simplification

For details, request Catalog No. 89.
The Union Metal Manufacturing Company,
Canton 5, Ohio

UNION METAL
Material Handling Equipment

For more facts circle 590 on Reply Card

NEW PRODUCTS

(Begins on page 152)

ties, resist scuffing, have no appreciable color change, and be as easy to strip as any other wax. This polish is suggested for use on properly sealed wood floors as well as on asphalt, vinyl, linoleum, rubber and other interior floors. The Fuller Brush Co.

More information on any of these products can be yours without cost or obligation. Just circle the item numbers on the Reader Service Cards provided on pages 209-210.

31—CONNECTORS, for copper or aluminum, go on easily

Color-keyed connectors, compatible with either copper or aluminum conductor, are installed with a new light-weight hydraulic tool which delivers 12-ton force. Tool installation range in the color-keyed series is from No. 12 aluminum or copper to 750 MCM aluminum or copper. Proper

installation die is selected by matching its color with that on the connector to be installed. The die halves are then hand-inserted into the tool. The compression is completed within seconds along the barrel of the connector to provide a permanent connection of high conductivity. The connector line includes terminals (one, two or four bolt holes) two-way connectors, taps, and connectors reducing aluminum to copper of equivalent current capacity. Thomas & Betts Co.

32—CLEANER combines three maintenance functions

Di-Crobe Germicidal Cleaner is described as a multi-purpose germicide combination which cleans, disinfects and deodorizes in one operation. It is said to provide fine cleaning action and

If you can't buy now... then LEASE

WANTED
NEW HEATING SYSTEM
...but must conserve capital
Manufacturers engaged in plant expansion or modernization plans must have modern, economical heating system, but must conserve capital for

Plant expansion or modernization plans may call for a new heating system, but working capital must be conserved for other uses. If this is *your* problem, the Dravo Heater Lease Plan offers an economical solution. You can have the money-saving heating you need *now*, without tying up your working capital. The following examples, based on actual installations, demonstrate how the Plan works:

EXAMPLE A—plant expansion program to include replacement of an outmoded steam heat system in both old and new buildings. Gas-fired space heaters with an output of 11,630,000 Btu's would be required to provide comfortable, even heating plus summer ventilation. In addition to lower maintenance costs, *savings in fuel alone would total $11,000 annually.* Further benefits in terms of increased worker efficiency could also be anticipated.

WITH THE DRAVO HEATER LEASE PLAN

This type of installation could be put to immediate use without capital investment. The Plan would cost:

Lease Plan Time	5 years
Cost per Year* (payable quarterly)	$8,010.00

With estimated annual fuel savings of $11,000, the Lease Plan would net the owners a saving of nearly $3,000 per year.

EXAMPLE B—a sprawling, high-roofed structure with uninsulated metal walls. Coke-fired salamanders inadequate for heating. Gas-fired space heaters producing 6,500,000 Btu's would provide and maintain comfort heating regardless of weather. *Valuable space would be saved, fuel and maintenance cost reduced by nearly $4,500 annually.* Worker efficiency would be increased because of the elimination of smoke and sulphurous fumes from the salamanders.

WITH THE DRAVO HEATER LEASE PLAN

This is a situation made to order for the even, low-cost heating supplied by Dravo heaters. Plan cost...

Lease Plan Time	5 years
Cost per Year* (payable quarterly)	$3,330.00

With estimated annual fuel savings of $4,500, the Lease Plan would have meant a saving of nearly $1,200 per year to the owners.

EXAMPLE C—a plant containing more than 48,000 sq. ft. of floor space with excessive heat loss through frequently opened truck doors. Economical, even heating impossible to maintain with old, coal-fired boiler. Dravo gas/oil-fired heaters, producing 4,000,000 Btu's, would provide a constant level of comfort heating. *Estimated savings in fuel and other costs would total $5,800 a year,* in addition to saving valuable floor space.

WITH THE DRAVO HEATER LEASE PLAN

An installation of this type would bring immediate benefits in terms of comfort heating. Here is how the Plan costs would look:

Lease Plan Time	5 years
Cost per Year* (payable quarterly)	$2,600.00

Again, savings far outweigh the cost of the heaters on the Dravo Heater Lease Plan.

*Note—this does not include installation costs.

These examples indicate what can be achieved with a modern, economical Dravo Heater installation. If you are engaged in expansion plans, Dravo Heaters, purchased on the Dravo Lease Plan, offer immediate savings and the retention of capital for other uses. A letter or phone call will bring you complete information. Use the coupon or phone: Dravo Corporation, Pittsburgh 25, Pennsylvania.

DRAVO
CORPORATION

DRAVO CORPORATION, Pittsburgh 25, Pennsylvania

Please see that I get full information on the new Dravo Heater Lease Plan.

Name_____

Title_____

Company_____

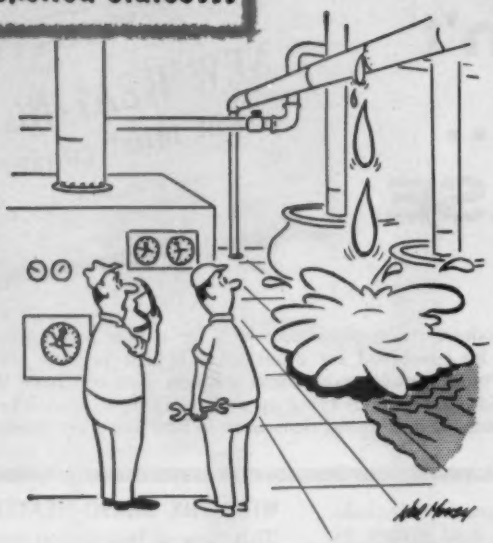
Address_____

City_____ Zone_____

State_____

For more facts circle 591 on Reply Card

Life in these excited states...



"I can't stand that constant drip-drip-drip!"

Corrosion got the drop on you?

Little drips can mean big losses... repairs, downtime, ruined equipment. You can put an end to 85 to 100% of these problems with Ace chemical-resistant rubber and plastic piping, valves, pumps, tanks and other equipment. American Hard Rubber Company's 108 years of experience is at your service.

All-purpose rigid PVC. Sched. 40, 80 & 120, ½ to 4". Threaded or socket-weld fittings. Valves ½ to 2". NSF-approved. *Bul. CE-56.*

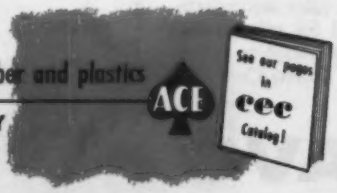
Improved design... now 12 gpm. All wetted parts acid-resistant, wear-resistant Ace hard rubber. Finest available. *Bul. CE-55.*

Flexible poly pipe, ideal for water lines, drains, underground pipe or conduit. Sizes ½ to 2", long coils, NSF-approved for drinking water. *Bul. CE-57.*

World's best chemical valves ... at moderate prices. All-plastic, rubber-lined, or all-hard-rubber. ⅛" pet cocks to 24" gate valves.

ACE processing equipment of rubber and plastics

AMERICAN HARD RUBBER COMPANY
DIVISION OF AMERACE CORPORATION
Ace Road • Butler, New Jersey



For more facts circle 592 on Reply Card

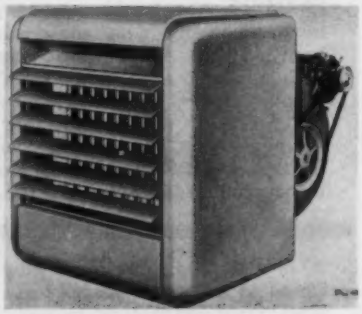
NEW PRODUCTS

(Begins on page 152)

efficient germ-killing properties. Because of the absence of soap, Di-Crobe does not require rinsing and leaves an active germicidal layer on surfaces cleaned, it is noted, but will rinse off if desired. Manufacturer says this cleaner can be used on all inanimate surfaces not harmed by water alone. It can be used in any kind of water, hard or soft, hot or cold, and applied with mop, sponge or rag. Huntington Laboratories Inc.

33—UNIT HEATERS are gas-fired blower type

These gas-fired unit heaters with slow-speed centrifugal blowers come in two types—free-delivery units with adjustable louvers (Type FD, shown) for

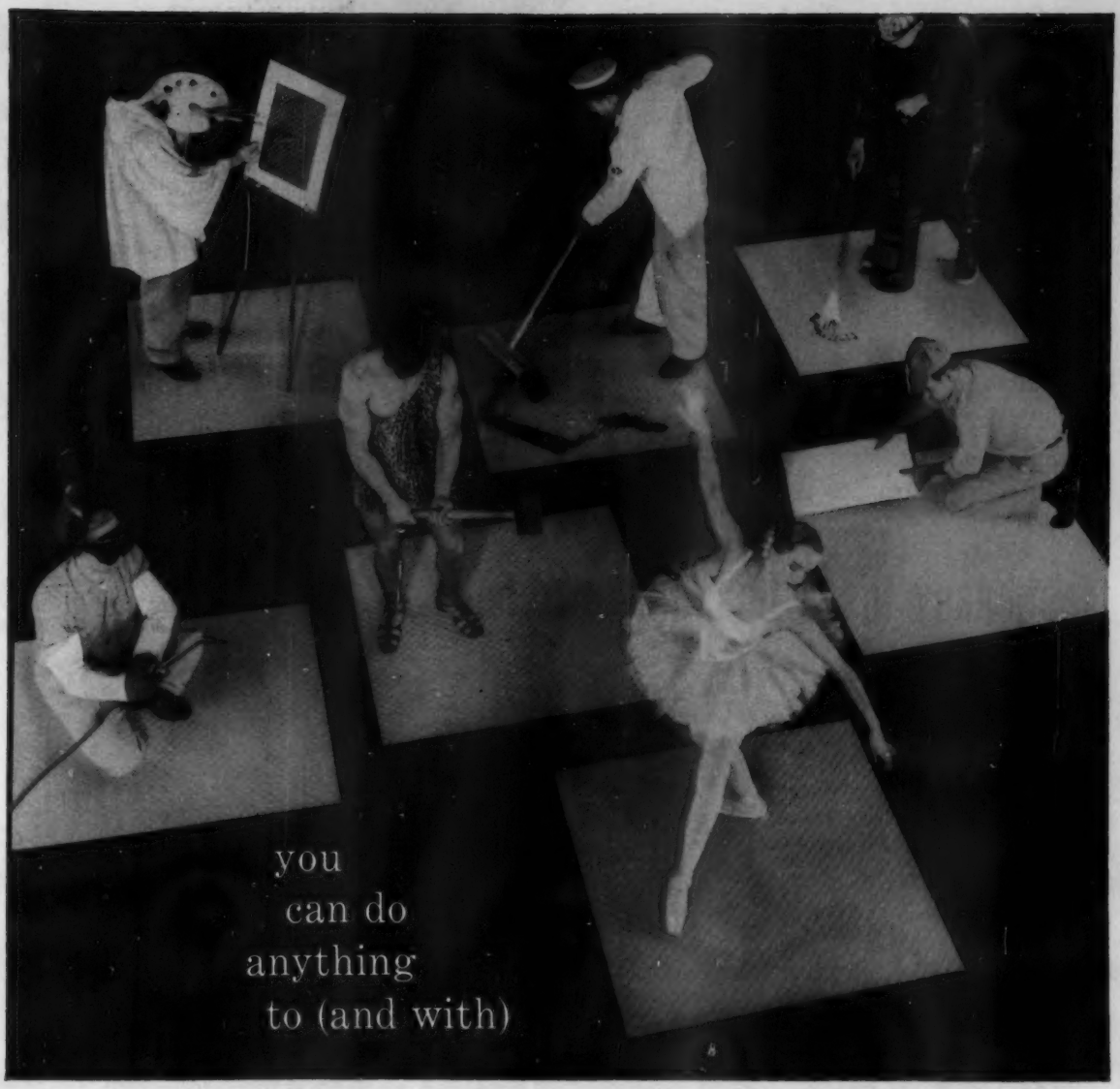


effective air distribution in the proximity of the unit, and ductwork units (Type DW) for distribution to remote areas. The heaters are suggested for applications where large volumes of air must be moved quietly—as in offices. Eight models have output ratings from 40,000 to 200,000 Btu. Data are in Catalog 1526. Sturtevant Div., Westinghouse Electric Corp.

34—PAINT SYSTEM offers maintenance advantages

Multi-color is a chemical formulation of two or more colors sprayed on at one time, from one source. These tough color particles are claimed to retain their individual colors to produce a textured, multi-color finish effect. The coating produced is reportedly nearly twice as thick as conventional paint finishes and twice as durable. According to manufacturer of Roxatone, one brand of multi-color paint, its durability and harder surface give the paint system extended life and maximum resistance to wear.

Supplied ready to spray, multi-color may be applied over most types of paint in plant interiors after the application of a suitable sealer—or applied over



INLAND 4-WAY* SAFETY PLATE

As you can see, 4-WAY SAFETY PLATE is fireproof, can be bent, welded, hammered, painted. It can be cleaned with ease, can be cut, sheared, shaped to any curve or angle, drilled or punched. An outstanding feature of 4-WAY is its *slip-proof* character, as shown by the dancer. On catwalks, stair treads, truck beds, shop floors it provides positive traction, reduces hazards, safeguards employees.

Maintenance is extremely easy, fabrication and installation is simple. In many cases, no special skills are required—standard shop tools are all you need. On the floor, on the wall, on your machinery or your rolling stock, 4-WAY SAFETY PLATE is durable, attractive and economical. 4-WAY SAFETY PLATE is available from your Steel Service Center in Large Pattern—gages $\frac{1}{4}$" to $\frac{3}{4}$", Medium Pattern—gages 16 to $\frac{1}{4}$" and Small Pattern in 18 gage.

INLAND STEEL COMPANY

30 West Monroe Street • Chicago 3, Illinois

*Registered Trademark

For more facts circle 593 on Reply Card

fast, easy inspection and maintenance

Continental

2-PASS AUTOMATIC BOILERS

The Two-Pass design of the *Continental* Boiler is the most practical and economical approach to heat transfer in Packaged Boilers today. In addition to eliminating separation or refractory baffles required in boilers with "excess" passes, it also provides design refinements which cut down on inspection and maintenance costs and keep down time to a minimum.

New!

Easy Accessibility

Continental design provides a ball bearing davited rear door that is opened in minutes. Door has substantial groove-type industrial packing for gas tight closure. This is a simple, practical, proven feature that means important savings for the life of the boiler.

Send for this Data File . . .

Get the facts on how a *Continental* Two-Pass Automatic Boiler can solve your problems. Write today on your company letterhead to Dept. HP-8 for latest data.

over a half century of boiler building experience

BOILER ENGINEERING & SUPPLY CO., INC.

Phoenixville, Pennsylvania

nation-wide sales and service in principal cities

For more facts circle 594 on Reply Card

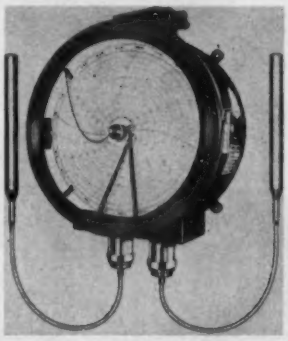
NEW PRODUCTS

(Begins on page 152)

previous multi-color without special preparation. A gallon covers 150 to 200 sq ft, and one coat covers most surfaces. Another advantage noted for multi-color is that any scars or cracks occurring are less noticeable and easily touched up. The paint is washable, and offers economy of material costs, since one coat applied in a 5-mil thickness costs less than two or more coats of conventional paint required for the same thickness and durability. Roxatone Corp.

35—THERMOMETER records process temperatures

This dual recording thermometer, named TRH, is designed to sense and record temperatures up to 1100 F limit, simultaneously in two locations. It is claimed especially appropriate where critical analysis of process temperatures may be required. The TRH



has two thermal sensing elements and two pen mechanisms in the same body. It is available with electric or spring-driven chart drive. The pens operate on a 2-hr differential on thermometer to prevent any possible interference in case both sensed temperatures happened to be the same. Ten scale ranges are applicable. Elements of the same scale range are interchangeable, regardless of bulb type, allowing field replacement of elements. The Partlow Corp.

36—ELECTRIC TRUCK has resistorless control

To speed handling of large loads in narrow aisles, this manufacturer introduces a compact 6000-lb capacity electric truck featuring a resistorless control. The latter is said to reduce heat losses and promote high electrical efficiency. The control draws current from the truck battery at a proportionate rate to the speed of

For more facts circle 595 on Reply Card →

TEXACO ORGANIZED LUBRICATION CAN HELP YOU...

End replacement parts waste

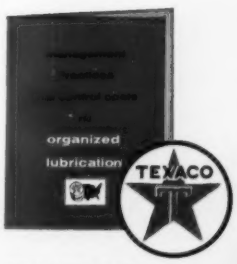
One Northeastern manufacturer replaced parts in a major machine every two weeks—a not uncommon practice in industry today. He marked it off as a normal maintenance expense. It wasn't really—it was the result of faulty lubrication practices. A Texaco Lubrication survey spotted the trouble—solved the problem. Now the manufacturer operates with a Texaco Organized Lubrication Plan—and the trouble no longer exists.

Chances are the same thing is happening in your plant right now—It doesn't have to.

A Texaco Organized Lubrication Plan can extend parts life significantly—saving thousands of dollars in replacement parts and even more in uninterrupted production for longer periods.

Get full details on Texaco Organized Lubrication from your local Texaco Lubrication Engineer. He can supply you with a copy of "Management Practices that Control Costs via Organized Lubrication." Or write:

Texaco Inc., 135 East 42nd Street, New York 17, N. Y., Dept. E-110.



LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

UNIVERSAL WINDING COMPANY

Safeguards Against Motor Burnouts...

by Specifying and Using 3-Phase Motors with Built-in KLIXON PROTECTORS on UNIFIL Loom Winders

The Unifil Loom Winder, introduced by Universal Winding Company after years of research and development work, is meeting unprecedented reception as a new concept of filling yarn preparation for the textile industry.

This new machine has, since its inception, featured a KLIXON-protected 3-phase motor.

Universal Winding, like many other manufacturers, has found that motors with built-in KLIXON Protectors:

- Eliminate motor burnouts
- Increase motor output under adverse operating conditions
- Simplify motor controls
- Reduce motor installation costs, repairs and replacements
- Save on production down time

Because KLIXON 3-phase Protectors are responsive to both current and temperature, motors will not burn out from overheating . . . but instead they handle any load condition under any surrounding temperature condition.

KLIXON Protectors safeguard motors against the following conditions:

Prolonged overloads, unbalanced voltage, stalling, failure to start, increase in ambient temperatures, lack of ventilation, plugging or reversing duty, single-phasing.

KLIXON Motor Protectors are available for 3-phase motors ranging in size from fractionals up through 7½ h.p.

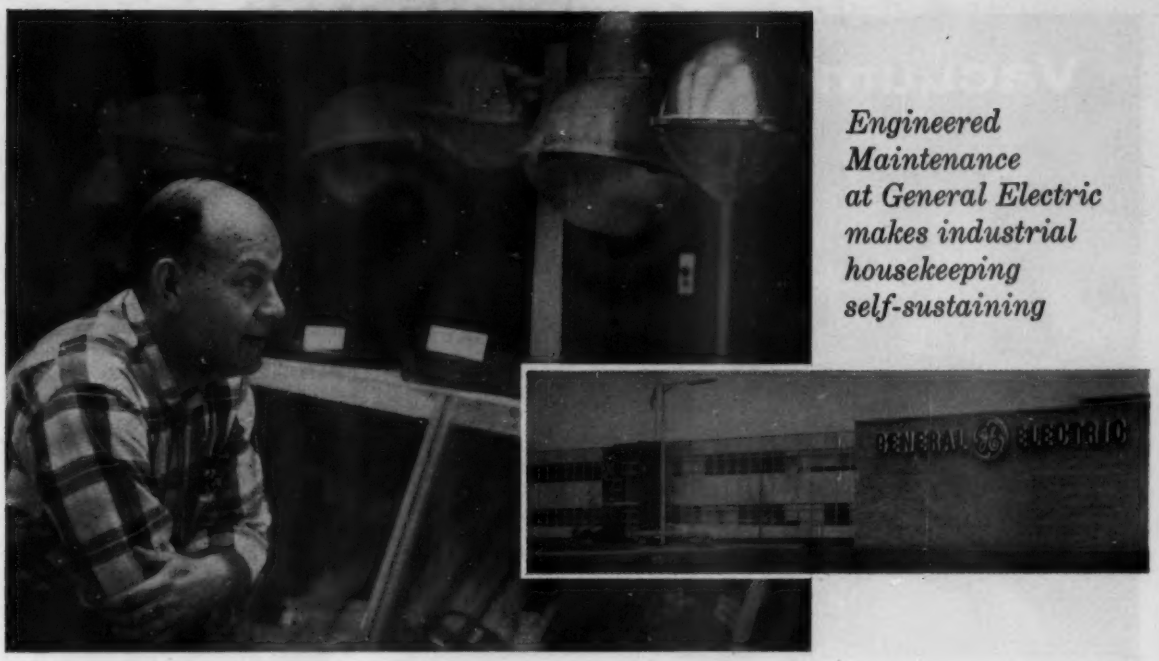
Get full details from your motor salesman, or write for your copy of Bulletin PR-1243. Then specify motors with KLIXON Inherent Overheat Protectors. The savings you receive more than offset the slight additional cost.

METALS & CONTROLS

4508 FOREST STREET, ATTLEBORO, MASS., U.S.A.
A DIVISION OF TEXAS INSTRUMENTS INCORPORATED

Spencer Products: Klixon® Inherent Overheat Motor Protectors
Motor Starting Relays • Thermostats • Precision Switches • Circuit Breakers

For more facts circle 596 on Reply Card



Engineered Maintenance at General Electric makes industrial housekeeping self-sustaining

"Now our sanitary maintenance program no longer demands continuing supervision and scheduling"

"Puritan's ENGINEERED MAINTENANCE has practically eliminated the need for constant checking of our custodians' work, thus freeing management for other important maintenance and production functions."

Ralph F. Fiske, Supervisor of Plant Facilities Engineering at General Electric's Outdoor Lighting Department, Hendersonville, North Carolina, also states:

"In what has come to be known as 'the outdoor lighting center of the world,' ENGINEERED MAINTENANCE provides a comfortable, safe, and efficient working atmosphere... another example of the fact that at General Electric, 'Progress is our most important product'."

How Engineered Maintenance works

You receive a complete, individually planned program, based on a personal inspection of your plant, and prepared by professional engineers. The program is set up to meet the exact requirements of your company. Your custodians' work is organized. You are provided with a system of automatic controls. You are certain of continuing follow-through and review, not only by members of your organization, but by Puritan trained service representatives as well.

Why it is so important

In these days of increasing operating costs, more efficient sanitary maintenance is the logical way to protect your company's investment in plant, equipment, and higher pay scales. Management appreciates this... and Engineered Maintenance provides you with a new and tested solution, without requiring you to ask for a larger budget.

Engineered Maintenance is available as a service — without charge to you!

Puritan will inspect your plant, review your present sanitary maintenance procedures, submit and help install an individually planned Engineered Maintenance Program for your company. As a user of Puritan Sanitary Maintenance products you receive this service free.

Puritan products are nationally used, competitively priced, fully guaranteed. You do not pay a premium of any kind for either your Engineered Maintenance Program or for any Puritan product. You are not involved in any long-term contract. The burden of proof is upon us.

New booklet gives more detailed explanation

Write for "Engineered Maintenance." This new technical brochure explains the Puritan program fully... shows how it will help your company... how it will save your time.

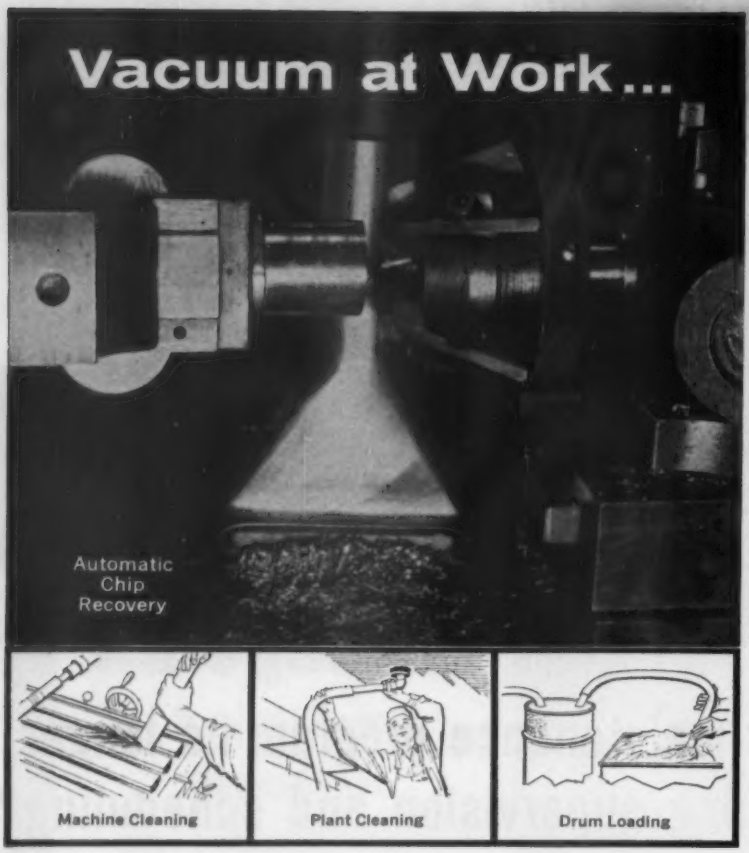
COPYRIGHT 1959 PURITAN CHEMICAL COMPANY

PURITAN CHEMICAL COMPANY

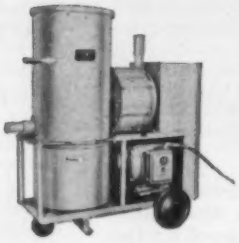
EXECUTIVE OFFICES: 916 ASHBY STREET, N. W. • ATLANTA 18, GEORGIA

PLANTS & WAREHOUSES: ATLANTA, GEORGIA • HOUSTON, TEXAS • ST. LOUIS, MISSOURI

For more facts circle 597 on Reply Card



INVINCIBLE Units May Solve Your Problem!



Flexible Invincible vacuum equipment recovers, reclaims, processes, conveys. It will handle metals, liquids, lint, gases—virtually anything that can be passed through a vacuum line.

Vacuum created by Invincible units may be brought to the point of application on wheels or through pipe. Portable machines can be taken off production work during off periods and used as vacuum cleaners, thereby controlling health, fire and explosion hazards.

Capable of continuous operation, rugged Invincible equipment has solved hundreds of production problems, reduced costs and simplified the design of automatic machinery. Over 150,000 Invincibles are currently in use . . . 5,000 are in their 35th year of service.

There are 28 different standard Invincible models, plus special machines and other combinations, ranging from ½ to 10 H.P. More than 50 years of experience in vacuum application are available. Resident engineers in principal cities. Accurate free surveys can be made on short notice.

Write us for detailed information concerning *your* problems.

INVINCIBLE VACUUM CLEANER MFG. CO.
DOVER, OHIO

For more facts circle 598 on Reply Card

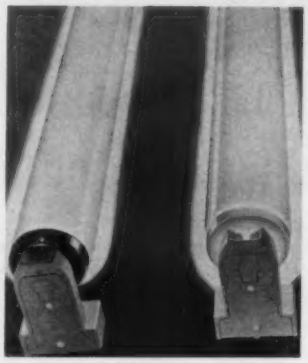
NEW PRODUCTS

(Begins on page 152)

the truck, giving a low starting current draw but without sacrifice to starting torque, it is explained. The truck itself is just 76 in. long from the rear of its counterweight to the face of its forks. It has a turning radius of 69 in. and can right-angle stack with a normal load in 11-ft wide aisle. Lifting speeds are 45 to 50 fpm unloaded, 25 to 30 fpm under load. Traveling speeds range to 6½ mph unloaded, to 6 mph under load. The Yale & Towne Mfg. Co.

37—FLUORESCENT LAMP lights from end to end

The 40-w fluorescent lamp shown at the right lights all the way to the electrical contact pins. Even the bases on the end of the lamp provide illumination in contrast to the regular base



shown at left. This is the result of a translucent plastic material used instead of the conventional opaque metal or plastic base. It is said to provide a vastly improved appearance in the lamps, lighted or unlighted. Westinghouse Electric Corp.

38—COMPOUND inhibits corrosion in closed systems

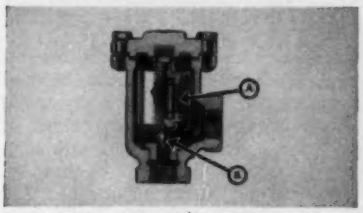
Success in inhibiting corrosion in closed recirculating water systems—with or without anti-freeze—is claimed for Corrosion Inhibitor CS, a non-chromate product. According to company, it protects not only steel, but also copper, brass, aluminum and solder. Field evaluation tests are reported to show it effective in preventing corrosion in air conditioning systems, diesel and gas engines, compressors, process cooling water systems, hot water boilers, heat pump systems etc. Corrosion Inhibitor CS is compatible with anti-freeze, it is stated; it won't stain or cause dermatitis, and requires a minimum of

Full-range steam traps cut high cost of steam pressure variations

By John W. Ritter, Test Engineer
SARCO Company, Inc.

While boiler room economics dictate that boiler pressures remain constant, the equally sound economics of batch processing may decree that pressures at the equipment vary with the requirement of the process. The attempt to choose a steam trap that is all things to all conditions may result in installing traps that operate inefficiently at either extreme of their pressure range or that require adjustment every time the operations sheet calls for another pressure-temperature setting. Orifice traps represent a somewhat more rational approach to the problem, but often at the price of a continuous discharge of steam, particularly at the low pressures of start-up and shut down. Compromise, adjustment, and steam waste all spell inefficiency in the utilization of steam.

Production-Planned steam trapping, on the other hand, improves efficiency by the use of properly designed and installed thermostatic steam traps. Such traps employ the expansion and contraction of a thermostatic element to operate the discharge valve.

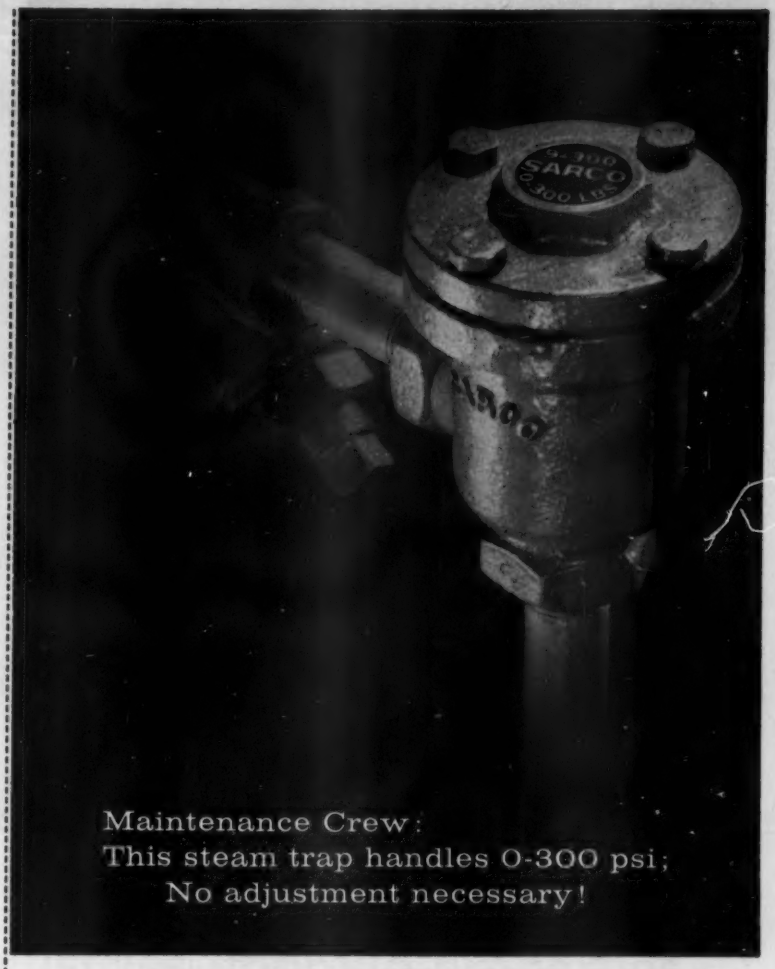


In Sarco Thermostatic Steam Trap, element (A) expands at steam temperature to close valve (B), contracts to permit discharge of condensate.

In the Sarco "Balanced Pressure" Thermostatic Steam Trap a volatile fluid is sealed inside a metal bellows that opens or closes the valve as it contracts or expands with condensate temperature. Near steam temperature, evaporation of the fluid creates an internal pressure greater than steam pressure in the trap body, and the expanding bellows seats the valve. When the condensate cools, the element contracts and opens the valve.

It is evident that at steam temperature pressure inside the element is higher than steam pressure, no matter how the latter may vary. Thus, the trap compensates automatically for variations in pressure.

58108



Sarco "Balanced Pressure" Thermostatic Steam Traps cut trap maintenance costs and simplify parts inventory. Why? Because the same bellows, head and seat handle steam pressures up to 300 psi – without any need of adjustment for variations in load or pressure.

Other advantages: unmatched capacity/cost ratio (1" size discharges 9,650 lbs/hr. at 10°F below steam temperature, 125 psi). This trap can't air-bind and, when installed with free discharge, can't freeze.

Long life and reliable performance are assured by an exclusive Sarco process for fabricating the one moving part – the thermostat – and by steam-testing of every single trap at maximum rated pressure.

Write for "Literature Kit 1A" today. And remember, Sarco can give you impartial advice on *Production-Planned* steam trapping because . . .

SARCO
COMPANY, INC.
635 Madison Ave., New York 22, N. Y.

Only Sarco makes all 5 types:
Thermostatic • Liquid Expansion • Float Thermostatic
Thermo-Dynamic • Bucket

STEAM TRAPS • TEMPERATURE CONTROLLERS • STRAINERS • HEATING SPECIALTIES

For more facts circle 599 on Reply Card

Where dirt could mean disaster . . .

Cleaning interior of B-52 Stratofortress during assembly. Boeing Airplane Co., Seattle, Wash.

You'll find SPENCER VACUUM CLEANERS

At Boeing, vacuum is used to remove metal shavings, dirt, solder droppings and stray rivets from areas which subsequently will be covered . . . and to keep foreign particles away from delicate instruments.

And the rugged, high suction Spencer units have a second major function: maintaining general plant cleanliness.

Whatever *your* needs . . . production quality control or routine maintenance . . . there's a full powered Spencer vacuum cleaner to handle the job—*better*. Models from 1½ H.P. to 15 H.P.

Request descriptive catalog No. 155B.

The SPENCER TURBINE COMPANY
HARTFORD 6, CONNECTICUT

For more facts circle 600 on Reply Card

NEW PRODUCTS

(Begins on page 152)

checking during stand-by because oxygen in-leakage doesn't affect it. Hagan Chemicals & Controls, Inc.

39—HEAVY DUTY HOISTS designed for long service

Included in the Balanced Design Hevi Lift line of wire rope hoists are units with lifting capacities from 2000 to 50,000 lb, with lug, hook, plain, hand-geared, or motor driven trolley mountings, with standard or low headroom (shown) arrangements, as well as

base, wall, ceiling and deck mountings. Powered trolleys may be had with single-, two- or variable-speed drives. Lifting speeds range from 10 to 20 fpm to 20 to 100 fpm, with lifting heights from 15 to 100 ft. Power arrangements include 115/230 v, d-c and 220/440/550 v a-c, two and three phase, 50/60 cycles, with 24-v operating controls.

Principal user-advantage claimed for the new hoists is "balanced design" in that each part of the motor, gear case, drum assembly and brakes has been "balanced" or matched against each other for strength, temperature and performance characteristics. Even under severe duty cycles, motor, gear case and brakes continue to function as designed, it is stated, without excessive heating or abnormal wear of a single component. Harnischfeger Corp.

40—ADHESIVES make polystyrene foam stick

Polystyrene foam is reportedly "stuck to stay" when bonded with two new adhesives which, according to manufacturer, defy separation of the foam from steel, aluminum, Masonite wood and other materials—the polystyrene, itself, fails before the cemented bond can be broken. One of these adhesives, A-827-B, is for foamed-in-place poly-

BEST ROOF PROTECTION IN TENNESSEE—OR ANY STATE!

Buel Lumber Company plugged nail holes and small cracks—improved appearance of the whole building with Uniflex Green Tone, made by **Acorn Refining Company**, Cleveland 2, Ohio.

The aluminum flakes in Uniflex form a metallic shield that keeps the coating pliant and waterproof in all seasons. This is George Wilson Plumbing & Heating Company's warehouse in Memphis.

Memphis industries improve properties with Uniflex Colored Aluminum Coating

One economical coat of *Uniflex* Colored Aluminum Roof Coating has brightened the public's view of two well-known Memphis firms—Buel Lumber Company and George Wilson Plumbing & Heating Company. Both chose *Uniflex Green Tone*, one of several available colors.

These roofs happen to be corrugated metal. But coatings like *Uniflex* work equally well on built-up composition, asphalt shingles, rolled roofing, concrete, cinder block and stucco—in fact, on most of the popular roof and siding surfaces.

No matter what the roof, life is cooler under *Uniflex*. Reflective aluminum flakes turn back a lot of the sun's heat, help keep interiors more comfortable in summer.

Made with ALCOA® Pigments, good colored aluminum coatings like *Uniflex* remain firm and pliant in any climate for many years. Here's all the weatherproof protection of a tough, fibrated aluminum coating—with attractive colors to match your building or surroundings.

ALCOA does not make roof coatings, but we will be happy to refer you to reputable manufacturers who do. Send for our booklets, *Painting With Aluminum* and *Aluminum Roof Coatings Make Time Stand Still*. Use the coupon.

For more facts circle 601 on Reply Card

ALCOA ALUMINUM

Look for this label... it's your guide to the best in aluminum value

For exciting drama watch "Alcoa Presents" every Tuesday, ABC-TV, and the "Emmy Award" winning "Alcoa Theatre" alternate Mondays, NBC-TV

Aluminum Company of America
1740-H Alcoa Building, Pittsburgh 19, Pa.

Please send your free booklets:

☐ Painting With Aluminum

☐ Aluminum Roof Coatings Make Time Stand Still

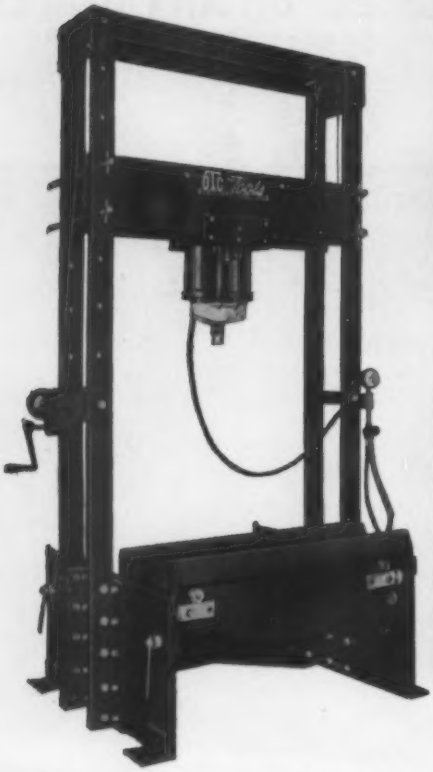
Name _____

Company _____

Address _____

City _____ Zone _____ State _____

Unique OTC Roll-Bed Hydraulic Shop Press Positions Work Quickly, Easily:



Bed is rolled *outside* the press frame to receive the unload hard-to-handle work.

One man easily rolls the bed and the work into position under the hydraulic ram.

Ideal for hard-to-handle work, the unique OTC *Roll-Bed* Hydraulic Shop Forcing Press permits overhead crane loading to bed which is outside the press frame — then work is rolled smoothly under the hydraulic ram. Unloading is just as easy. Rugged design of base, smoothly running rollers eliminates back breaking, dangerous loading, saves time. Cross head is adjusted to any height with winch — tapered pins lock it securely — trolley allows horizontal adjustment of ram for off-center work. Open sides admit long bars for straightening or bending. In 50 and 100 ton capacities, 8 ft. and 10 ft. high respectively, powered by manual or electric pumps. Other OTC Shop presses from 17½ to 50 ton capacities. See Sweets Plant Engineering File 2j.
Ow

Detachable Hydraulic Ram and Pump

Power-Twin *Center-Hole* rams and pumps on all OTC Shop Presses are detachable for use with OTC pullers for other maintenance work.

See Your Distributor or Write

OWATONNA TOOL CO.

446 Cedar St., Owatonna, Minnesota

RESEARCH · ENGINEERING · DEVELOPMENT

OTC

Designers and manufacturers of the world's most complete line of Maintenance Tools and Hydraulic Equipment.

For more facts circle 602 on Reply Card

NEW PRODUCTS

(Begins on page 152)

styrene applications. Assemblies properly bonded with it are claimed to withstand repeated simulated weather cycles involving: immersion in water at 120 F; hot water spray at 160 F; dry air at 160 F; storage at —40 F.

The other adhesive, R-1083-T, is for bonding pre-foamed polystyrene shapes to themselves, to polystyrene sheet or to steel, aluminum, Transite, Formica and other materials. Notable advantage announced for this adhesive is that it has no noticeable "stress crazing" effect on polystyrene. Bonds are said to withstand repeated simulated weathering cycles involving temperatures of 160 to —40 F plus water immersion and salt spray environment. Goodrich Industrial Products Co., Div., The B. F. Goodrich Co.

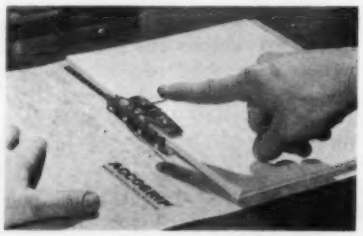
41—PIPE COVERS prevent condensation drip

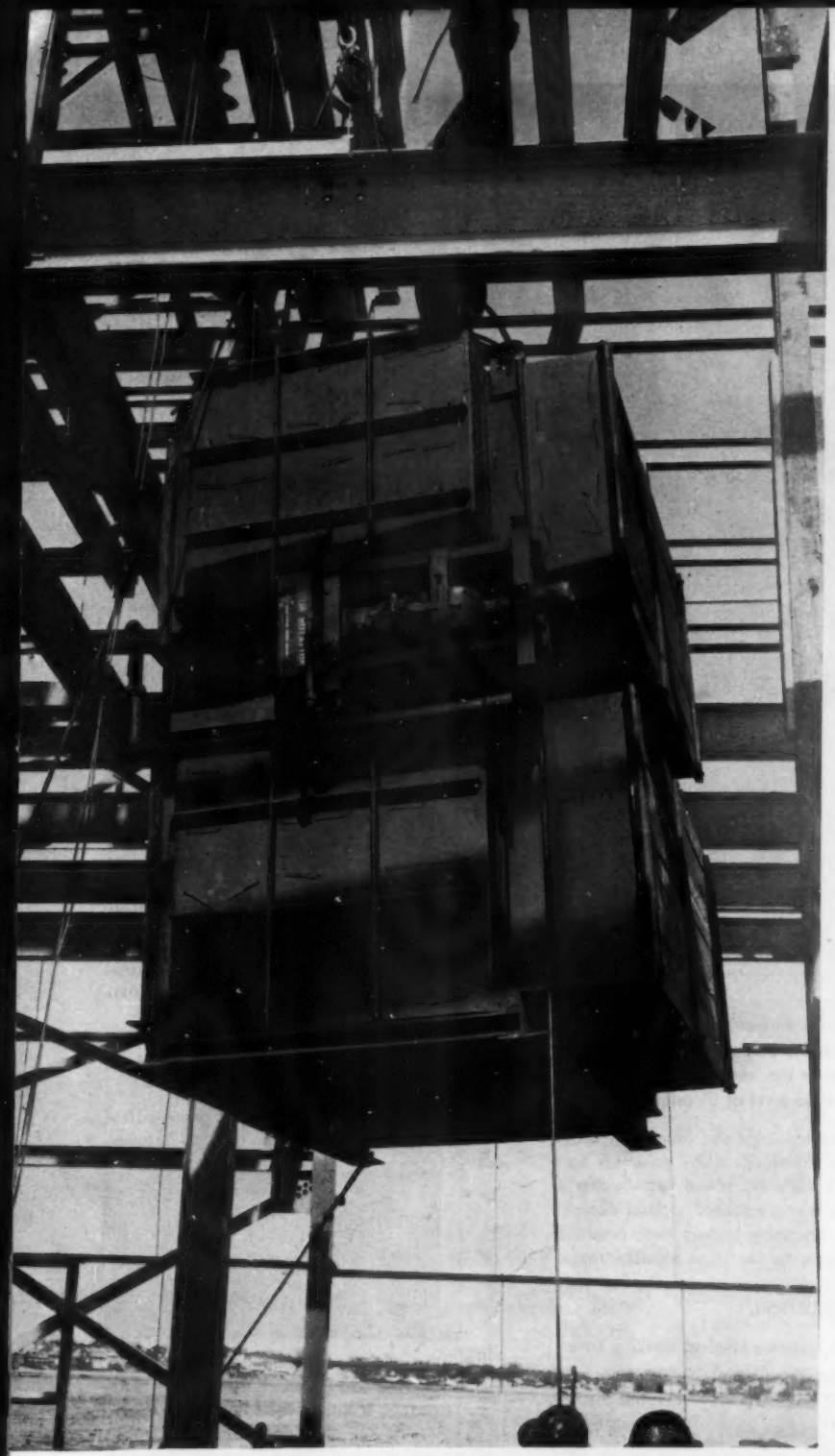
Anti-Drip Cold Water Covers are designed to stop condensation drip of cold water pipes during humid seasons. Installation is claimed simple—covers are simply placed around pipe, adjusted as to length and zipped closed. Available in standard colors to fit ¾ and 1-in. pipe. Other sizes can be ordered. Zippertubing Co.

Use the Reader Service Cards provided on pages 209-210 to ask for more information on the products. Circle item numbers of products in which you are interested.

42—PUNCHLESS BINDER has one-finger action

Accogrip binds papers without punching; a spring-action clamp opens or closes at the touch of one finger. For binding letters, photos, contracts, reports, catalogs, spec sheets and charts, Accogrip has up to ½ in. capacity, yet is designed to grip even one sheet. Anything bound stays until released by the spring clamp. Of flexible press-





Complete and ready to run, Package Air Preheater is lowered through steelwork of new power station at Braintree, Mass. Installation at Braintree Electric Light Dept. uses largest available package preheater, with a diameter of approximately 12'. Fitted to a 130,000 lb per hr boiler, this Package Air Preheater will boost combustion air temperature by about 420°F with heat recovered from stack gas.

PACKAGE AIR PREHEATER

gives twofold economy at Braintree's new power station

PACKAGE DESIGN FACILITATES INSTALLATION; FUEL SAVINGS TO WRITE OFF COST IN 2 YEARS.

Braintree, Mass., has achieved an economic double-header with the Air Preheater in their new power station:

1. Initial saving: The Package Air Preheater, shown above, was delivered as a completely preassembled unit. All it needs is gas ducts and a power line and it's ready to work—installed at a fraction of the time and cost required for conventional units.

2. Long-term savings: Records prove that Braintree's Package Air Preheater can pay for itself—just on fuel savings alone—within two years.

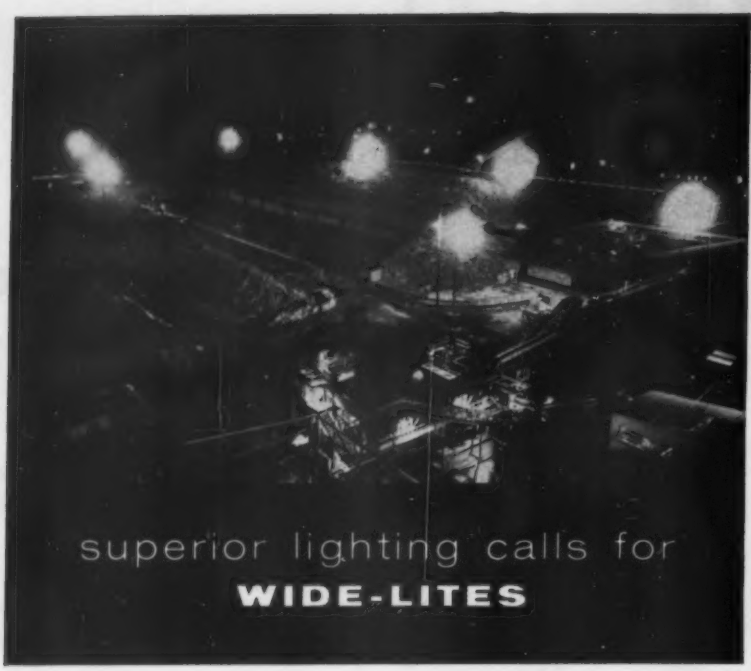
Package design gives you these advantages on boilers as small as 25,000 pounds of steam per hour —or as large as 250,000 lbs per hr. And a Package Air Preheater is one of the surest ways to reduce fuel consumption: you cut your fuel bill 1% with every 45-50°F increase in preheated air temperature.

Get all the facts. Write today for your copy of the free 14-page booklet describing the multiple savings you get with a Package Air Preheater.

THE AIR PREHEATER CORPORATION

60 East 42nd Street, New York 17, N. Y.

For more facts circle 603 on Reply Card



Around-the-clock operations at the Champion Paper and Fibre Company's sprawling Pasadena, Texas, plant called for illumination of a million square feet of wood storage area. And just thirty-two 1,000-watt Wide-Lite area lights were required to provide the answer – uniform coverage without distracting glare or dangerous dark areas.

Designed especially to enhance the unique characteristics of color-corrected mercury vapor lamps, Wide-Lites bring *new dimension* to area lighting. They produce broad patterns which provide smooth, even coverage without hot spots or dark shadows. The patterns may be accurately plotted to determine the exact number of units needed to provide any desired level of illumination.

Ruggedly constructed from cast aluminum alloy, Wide-Lites are finished in aluminum epoxy paint for corrosion control. Outdoor models are sealed with tempered glass lens, and re-lamping is accomplished without disturbing the seal of the lens. Exclusive built-in heat radiating fins limit lamp temperatures to the most efficient range. A choice of reflectors is available on all models, and sizes range from 100 watt to 1000 watt.

To assist you in planning efficient working coverage of outdoor working areas, Wide-Lite engineers have prepared a unique group of transparent plotting curves. Write today for your set!

WIDE-LITE.

manufactured by
WIDE-LITE CORPORATION
P. O. Box 191 • Houston 1, Texas
In Canada: Wide-Lite Division of Wakefield Lighted Limited London, Canada

OUTDOOR AREA LIGHTS • INDOOR LUMINAIRES • SPORTS LIGHTS • PROTECTIVE LIGHTS

For more facts circle 604 on Reply Card

NEW PRODUCTS

(Begins on page 152)

board with closed-back design, Acco-grip comes in letter and legal size, in five colors. Acco Products.

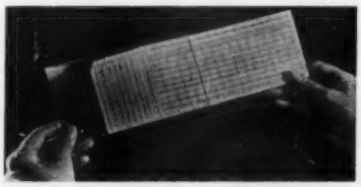
43—FORK LIFT is high speed, 2-ton unit

Model 310 Utility Fork Lift is a fast-rolling, 4000-lb wheel mounted fork lift with 10½-, 14¼-, or 21½-ft mast; it is designed for outdoor, or in-and-out handling of palletized, uni-

tized, or bulky materials. It lifts 4000 lb to 15 ft, 2500 lb to 21½ ft, has a top speed of 18 mph, is powered by a 42-hp, high-torque gasoline engine. Hydraulic power for lift is supplied by a 17-gpm pump at 1500 psi with four-position valve control. The power-train includes ferrometallic-type clutch, shuttle transmission, anti-friction bearings. The unit has 48-in. fork, or optional 36-, 42-, or 48-in. concrete block fork. J. I. Case Co.

44—PLASTIC SLEEVES protect the IBM cards

These vinyl plastic sleeves protect IBM cards from bending, dirt or damage.



One sleeve can hold several cards. Sleeves are 0.008-in. thick with transparent front, translucent back. Forbes Products Corp.

45—FLEXIBLE TUBING is lightweight, economical

Applications of Synflex-N3, flexible, lightweight pneumatic and hydraulic tubing, include maintenance-replacement of conventional tubing and rubber hose. It is a natural color polyamide formulation for permanent use

NEW AMESTEAM GENERATOR

MODEL AA

NEW Lower Cost

NEW Oil Burner

NEW Gas Burner

NEW Compactness

NEW Lower Fuel Costs

NEW Lower Maintenance Costs

NEW More Convenient Controls

. . . OLD AMES DEPENDABILITY

The **NEW** Model AA AMESTEAM GENERATOR offers the ultimate in steam generating efficiency and reliability.

The **NEW**ly designed low pressure air atomizing oil burner will cleanly and uniformly burn all commercial grades of oil — #4 with little or no preheat — for more efficient, economical firing. Since electric pumping and preheat loads are lower, power costs are greatly reduced. For gas firing the **NEW** ring type burner provides a more uniform flame pattern for cleaner, more efficient combustion.

All Model AA AMESTEAM GENERATORS are designed to operate at top efficiency over a modulation range of 20% to 100% of rating.

The Model AA incorporates Ames' time-proven 3-pass concentric tube design, single one-piece baffle and one-piece flue covers. Easier access is provided for inspection and servicing. The **NEW** ultra-compact design simplifies positioning and installation. All units are factory-assembled and fire-tested.

Before you buy a package boiler get the facts on the all **NEW** Model AA AMESTEAM GENERATOR.

AMES IRON WORKS, INC.
OSWEGO, NEW YORK

AMES IRON WORKS, INC., Box M-89, Oswego, N. Y.

Please send me full details on the **NEW** AMESTEAM GENERATOR Model AA Package Boiler.

NAME & TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

For more facts circle 605 on Reply Card

Specify PANNIER STEEL STAMPS for a longer life of CLEANCUT MARKING

29,335 hammer blows—and still marking cleanly—Pannier Letter and Number Stamps

Rounded corners for finger comfort
Rounded head distributes impact, reduces mushrooming.
Type size identification
Added metal in Pannier fillet increases durability. Correct bevel gives clearer impression, longer life. Outside bevel longer than inside for protection of character face.

Made of the finest tool steel and correctly heat treated for best combination of hardness and toughness, Pannier single character stamps can take it! Scientific shaping and accurate engraving insure a long life of good, clear impressions. Available in letters, figures and special symbols, and in light, medium or heavy duty design.

Extra tough steel forging stamps for hot or cold, heavy duty marking

For stamping names, part or patent numbers, trade marks and similar markings, Pannier forging stamps are made in four styles:—Hand-style, fullered for wire handle and wood handle style with eye parallel or perpendicular to lettering. All are designed and heat treated for clear impressions and long service. All are covered by the Pannier Master Marker guarantee.

Supreme Holders with "Roto-Pin" for quick, easy number change

An easy, half-turn flip for Roto-Pin releases any or all of the steel type for fast change. A reverse flip locks them in perfect alignment.

Roto-Pin makes this Pannier Master Marker a time saver in number change and makes serial number marking fast and efficient. The hardened anvil at the base of the type slot keeps type in perfect alignment for equal impression. Machined from bar tool stock, the Supreme Holder has a heat treated striking head. Both anvil and striking head are replaceable for longer life of the holder itself. Made in hand or wood handle styles, for hot or cold marking.

Write for literature

BIRTHMARKED MATERIALS — MARKING DEVICES — THE PANNIER CORPORATION

501 PANNIER BUILDING PITTSBURGH 12, PA.

Offices: Los Angeles • Cleveland • Chicago • Philadelphia • Birmingham

PANNIER MASTER MARKERS FOR QUALITY

For more facts circle 606 on Reply Card

NEW PRODUCTS

(Begins on page 152)

in lubrication systems, instrumentation, vacuum, chemical and effluent lines, and air lines to equipment, tools, etc. Two basic types are offered: Group I low-pressure tubing for applications to 1500 psi, and Group II for medium pressure service to 2500 psi; ⅛ to ⅜ in. OD. Synflex Products Div., Samuel Moore & Co.

46—CONNECTOR for use in branch circuit wiring

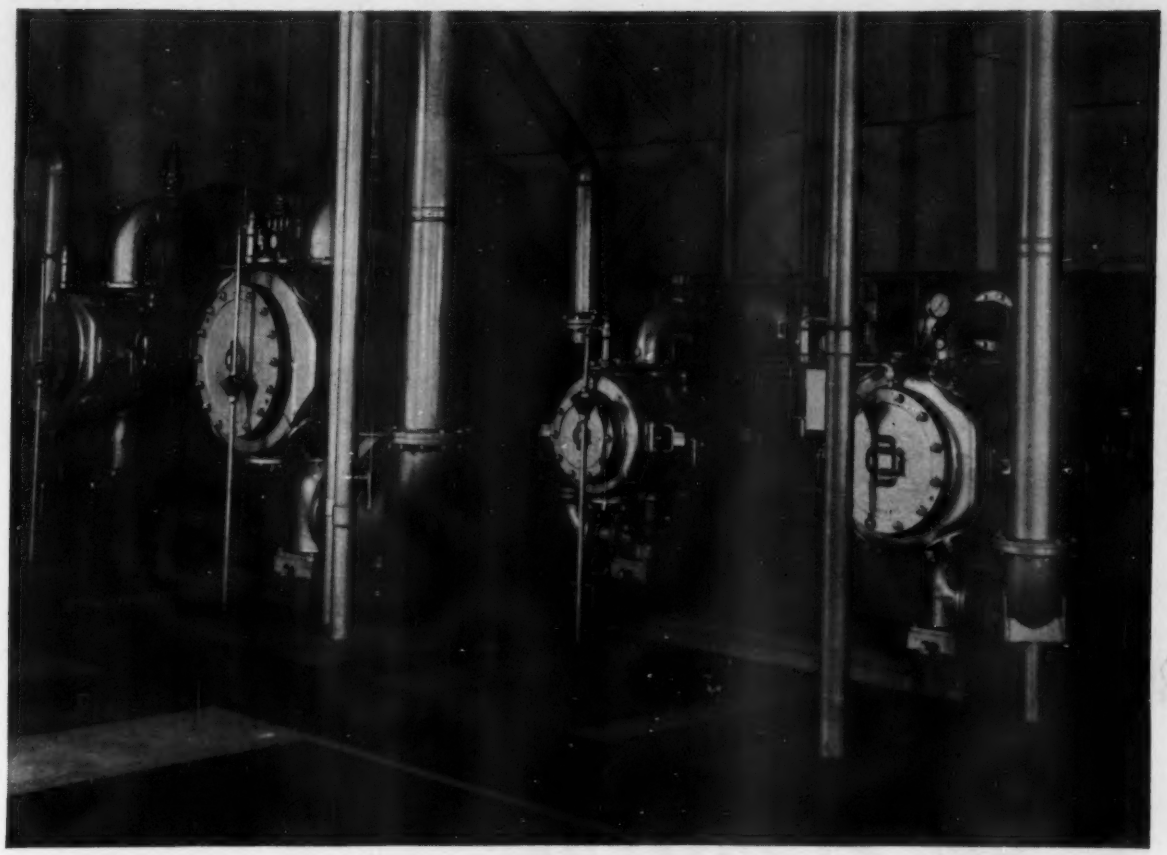
Joining heavy gage, hard wires used in branch circuit wiring is claimed easier with this wing-nut connector featuring built-in wrench, spring-tension grip and nylon insulating cap. The wings eliminate need for use of a

wrench, manufacturer points out, and the internal tension-spring coils adapt to shape and size of wire and apply pressure so great that the wires are actully threaded and crushed together. The nylon insulating cap has high dielectric and impact strength, and is semi-transparent—you can see the splice after it is completed. The connector comes in two sizes for wire connections from four No. 16 through two No. 6 with one No. 12. They are intended primarily for branch circuit wiring, machine hook-ups etc. Ideal Industries, Inc.

47—BIN VIBRATORS with greater impact force

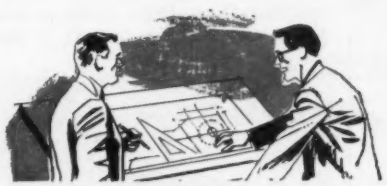
Types V3A-50P and V3A-50S are more powerful additions to company's Hi-Vi line of bin vibrators. The former is of the "impact" type in which vibratory output is in the form of steel on steel, while V3A-50S is semi-noiseless, having one of the inpact elements semi-resilient to provide cushioned impact. The vibrators are for use on bin walls of ¼-in. maximum thickness with a capacity of 50 cu. ft. Their greater impact is designed to prevent clogging, sticking and bridging in the larger, heavier bins.

Action of the Hi-Vi Vibrators simulates blows of hammer. While no control box or rectifier is needed to



New Gardner-Denver HAF compressor (left) now supplies all air for a large plant. HAC (right) was retained as a stand-by unit.

How to modernize your plant with a planned compressed air system



IN INDUSTRY—SPEEDING THE PACE,

the Gardner-Denver specialist is an integral part of the team. He works side by side with engineers and designers, helping to solve their problems, for at Gardner-Denver there's no substitute for men—our 100-year philosophy of growth.

In a sweeping modernization of its compressed air system, a large Midwest foundry recently replaced several small, power-eating compressors with *one* large Gardner-Denver HAF. The new unit is 23 & 13½ x 14, delivering 1750 cfm. Now the plant has a *planned* compressed air system—resulting in considerable power saving, and efficient air flow throughout the plant.

Even though the new HAF supplies all the air for normal plant operations, a Gardner-Denver HAC with a capacity of 750 cfm was retained as a stand-by unit. Other steps in the modernization included installing a new air receiver and a new, larger 8″ air line.

It'll pay you to take a close look at *your* compressed air. You may find modernization with a planned system a big cost-saver. A Gardner-Denver compressed air specialist will gladly look at your entire system—your compressor installation, your distribution system, your air uses and your maintenance of air tools. He can recommend the best solution to any compressed air problems you may have.

GARDNER-DENVER Since 1859 — 100 YEARS 1959

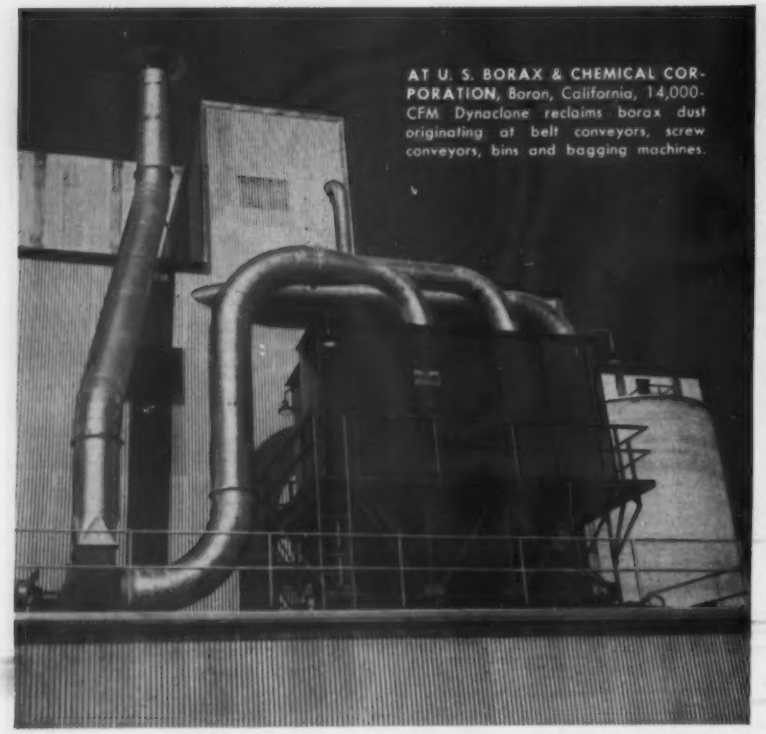
EQUIPMENT TODAY FOR THE CHALLENGE OF TOMORROW

GARDNER - DENVER

Gardner-Denver Company, Quincy, Illinois

In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Avenue, Toronto 16, Ontario

For more facts circle 607 on Reply Card


AT U. S. BORAX & CHEMICAL CORPORATION, Boron, California, 14,000-CFM Dynaclone reclaims borax dust originating at belt conveyors, screw conveyors, bins and bagging machines.

Constant Suction! Complete Collection!

SLY DYNACLONE®

The Dust Filter for Continuous Processes

Just turn this dust filter on and forget it. The Dynaclone operates continuously, 24 hours a day. It maintains constant, uniform suction at dust sources, reclaims all the dust to prevent air pollution and damage to plant equipment.

The Dynaclone has *new* "Resist-O-Wear" filter bags (patent pending) that give as much as three times longer bag life . . .

It has a new roller cleaner for simplified automatic self-cleaning. Resilient rubber rolls form a positive dust seal as each row of bags is cleaned by atmospheric air drawn in by the main operating fan.

And it contains more cloth per cubic foot of filter than any other make . . . greater filtering capacity with smaller space requirements.

Learn the many reasons why the Dynaclone represents a new high in dust filter efficiency . . .

Send for 36-Page Catalog 104

SINCE 1875 SLY

THE W. W. SLY MANUFACTURING CO.

4600 TRAIN AVENUE • CLEVELAND 1, OHIO
OFFICES IN PRINCIPAL CITIES

OVERSEAS LICENSEE: ANDREW AIR CONDITIONING LTD., LONDON S.W. 1, ENGLAND

For more facts circle 608 on Reply Card

NEW PRODUCTS

(Begins on page 152)

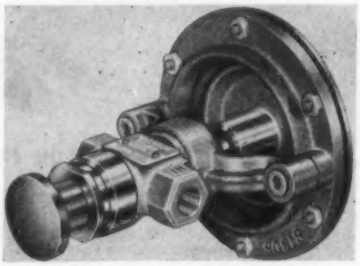
provide for power conversions from d-c to a-c, a simple control box is recommended by manufacturer, so that the vibrator can be adjusted to day-by-day variations in product or loading conditions. Eriez Mfg. Co.

48—SANITARY CASTERS reject dirt and dust

For application in food processing plants, bakeries, pharmaceutical plants, the B-line Casters include 4- and 5-in. swivel and rigid models designed to pick up a minimum of dust, dirt, food and other particles. Plate, horn, wheel and bearing surfaces are smooth. There is ample room (½ in. minimum) between wheel and horn to permit cleaning, company notes, and the aluminum alloy construction will not rust in steam or hot water cleaning. Wheel and swivel bearings are sealed to prevent dripping grease. Surfaces of recessed thrust washers are flush to wheel to prevent foreign matter from sticking. Load capacities are 400 lb for the 4-in. casters, 450 lb for the 5-in casters. Bassick Co.

49—AUTO-MANUAL VALVES for use in interlocked circuit

These auto-manual control valves are designed for automatic interlocking of manually-controlled circuits, or to permit manual operation of an automatically-operated system. In interlocked circuits, the valve can prevent out-of-sequence or accidental manual actuation, says manufacturer. In normally-automatic circuits, it permits manual operation for machine set-up, or emergency use. For interlocking, a stock



diaphragm end section is fitted to a standard body, with a knob, lever or other type manual control mounted on the opposite end. Manual operation is unrestricted until air is applied to diaphragm end. Actuation of the diaphragm returns the valve and holds it in status-quo position. Fitted with a return spring, the valve functions automatically, actuated by a three-way

any way you look at it...

YARWAY REMOTE LIQUID LEVEL INDICATOR GIVES BRIGHT, INSTANT, ACCURATE READINGS

On its brilliant "wide vision" dial you can clearly read the level from any point in a 180° arc—and from a considerable distance.

Remote readings of levels in boilers, feed water heaters and other heat exchangers are instant and accurate because indicator operating mechanism is actuated by the varying head of the liquid itself, yet the pointer mechanism is never under pressure.

Yarway Indicators may be arranged to operate remote Yarway Electronic Secondary Indicators or remote Hi-Lo Alarm Signals (lights or horns) located anywhere in the plant.

A record of nearly 13,000 successful installations speaks for itself.

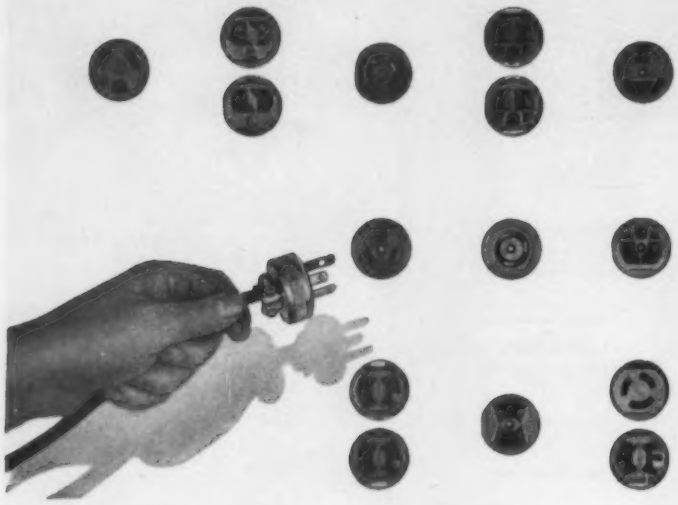
For details on construction, operation, installation and typical hook-ups, write for Yarway Bulletin RI-1825.

YARNALL-WARING COMPANY
100 Mermaid Ave., Philadelphia 18, Pa.
BRANCH OFFICES IN PRINCIPAL CITIES

YARWAY
A MARK OF QUALITY IN STEAM ENGINEERING

For more facts circle 609 on Reply Card

INDIVIDUAL PROTECTION STATIONS



SAFELETS

now available with a wide variety of receptacles and circuit breaker ratings

The Heinemann Safelet is a compact unit that neatly combines circuit-breaker safety with plug-in convenience. It has hundreds of applications, can be used for the individual protection of power tools, fractional horsepower motors and almost all general appliances.

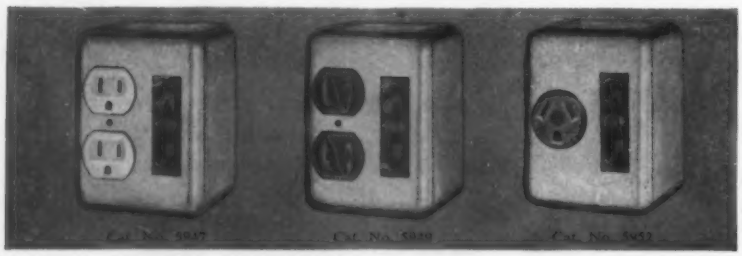
Now you can have the Safelet with any of a large number of receptacles, single and duplex, in twist-lock, polarized, "T" slot and other styles.

And now you can have a wide choice of circuit breaker ratings: from 6 to 50 amperes, at the most commonly used a-c and d-c voltages.

The Safelet enclosure is made of 16-gauge steel with an attractive grey hammertone finish. Units are available for either flush or surface mounting.

Of course, the circuit breakers used are Heinemann breakers . . . long accepted by the electrical industry as the standard of performance.

For full details, send for Bulletin 1000.



HEINEMANN

ELECTRIC COMPANY

128 Plum Street Trenton 2, N. J.

For more facts circle 610 on Reply Card

NEW PRODUCTS

(Begins on page 152)

pilot valve, instrument or process control. With actuating pressure off, valve can be operated manually.

Auto-manual valves, for use in air, oil or vacuum service, are available with two-, three-, or four-way valve bodies. Piped or open end exhausts are optional on the latter two. Port sizes range from ¼ through 1 in. NPT. Valve bodies are Navy M bronze, stems are chrome-plated stainless steel, and diaphragms are Neoprene-covered synthetic fabric. Bulletin D-58 gives details. Valvair Corp.

50—ELECTRODE HOLDER has molded pistol grip

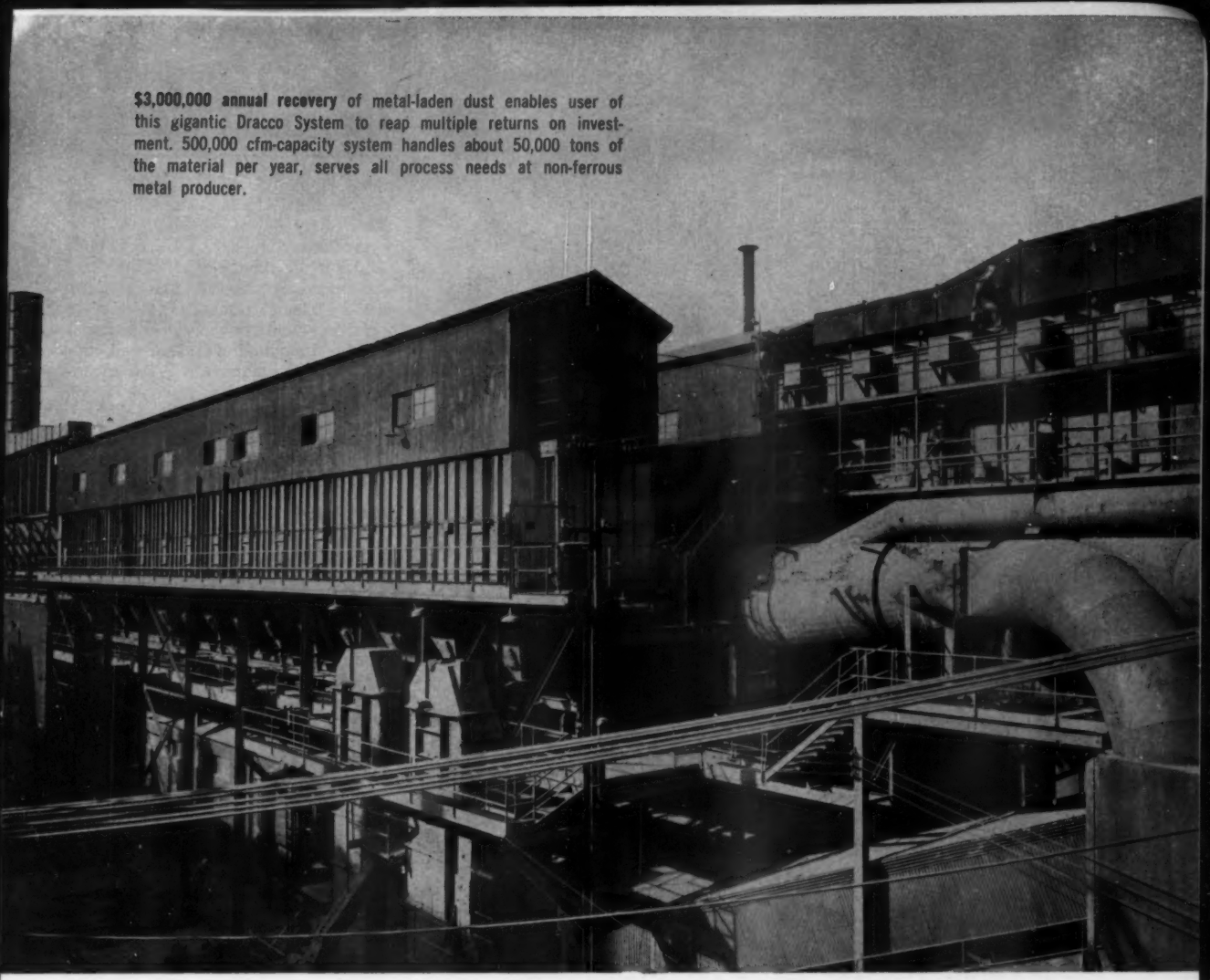
Resembling a large calibre automatic pistol, the Handi-Arc Electrode Holder has a molded pistol grip with built-in safety cut-out to prevent accidental

flashes or shocks. When the grip is released, current is off. Another advantage of the holder is its tip grip on electrodes which permits use of electrodes down to a short stub. The holder has heavy-duty milled copper jaws, adjustable to accommodate rods of different diameter, and an improved pushbutton stub ejector. The phenolic plastic case is bright red in color. Frank Niemi Metal Products, Inc.

51—SYNTHETIC SEALERS offer predetermined elasticity

Nos. 1175 and 1176 Strucsureseal Sealers are polysulfide base synthetic rubber sealants offering modulus control—a built-in characteristic allowing selection of predetermined elasticity for meeting requirements of most installations. For example, there is a Strucsureseal for use in normal expansion and contraction; there is one for extreme expansion and contraction.

The compounds are two-component materials consisting of base and accelerator. When mixed, the result is described as a material which cures to a tough, rubber seal. Strucsureseals are available in work times to compensate for weather conditions—longer working time for warm, humid conditions and shorter application time for cold,



$3,000,000 annual recovery of metal-laden dust enables user of this gigantic Dracco System to reap multiple returns on investment. 500,000 cfm-capacity system handles about 50,000 tons of the material per year, serves all process needs at non-ferrous metal producer.

big payoff, quick payout....

with Dracco Dust Control Equipment

Big installations.

Big benefits.

These are results of Dracco Dust Control Engineering. Over 40 years experience in the industry assures soundly engineered systems, solidly built to last. Some of the world's largest installations, such as the one shown here, are being made by Dracco.

But even if your plant is small, you can profit from Dracco Dust Control. You can eliminate raw material waste, cut plant clean-up costs, reduce wear on machinery, liquidate health hazards and halt air pollution with a system engineered to fit your needs. These benefits can pay for equipment and installation costs many times over, regardless of system size.

Why not put your dust problem in Dracco's capable hands? Chances are we've solved many problems just like yours.

DRACCO DIVISION OF FULLER CO.
4035 East 116th Street • Cleveland 5, Ohio

DRACCO *airstream* conveyors
dust control equipment

(Pronounced Dray'co)

For more facts circle 611 on Reply Card

Marley Double-Flow Aquatower®

cools a "hot tomato"

Chances are that your plant (unlike the one pictured) does *not* concentrate tomatoes, and that you do not require cooling water for an automatic can cooler. Chances are equally good, however, that your plant *does* have a "hot tomato" of some kind that could be easily cooled—at a worthwhile profit—by a Marley Double-Flow Aquatower.

Maybe it's a molding press . . . a furnace door . . . welding equipment . . . air compressors . . . refrigeration or air conditioning units . . . a process cooling requirement . . . some special seasonal demand. These are only a few of the "hot spots" alert engineers are changing to "profit spots" by conserving cooling water.

Industry's common solution to these cooling requirements is the Marley Double-Flow Aquatower. Often a single unit serves widely varied cooling requirements throughout a plant. It saves more than 95% of the cooling water that would otherwise be wasted . . . is a self-liquidating investment—and once its modest initial cost is amortized, it returns handsome dividends over its long service life.

Whether your cooling requirements are large or small, usual or individual, Marley offers a line of Double-Flow Aquatowers and smaller "packaged" towers that will handle every job dependably, economically and permanently. For information on the wide range of styles and sizes available, call your near-by Marley Engineer or write to

MARLEY **The Marley Company**

Kansas City, Missouri

For more facts circle 612 on Reply Card

NEW PRODUCTS

(Begins on page 152)

dry weather. The sealants are claimed particularly applicable in vertical, or overhead areas where resiliency, controlled-flow and good adhesion characteristics are needed. This includes use as glazing sealout, joint sealer in masonry construction, bedding and sealing compound in curtain wall construction. Presstite Div., American-Marietta Co.

52—SOLVENT DETERGENT routs carbon from engines

Composition 111 is formulated to remove carbon from pistons and clean a variety of engine parts. It can be mixed with water or with petroleum distillates, used at room temperatures or heated to about 100 F, rinsed with water or steam. It contains no phenolics, so disposal of spent solutions presents no problem, it is pointed out. Oakite Products, Inc.

It's easy to obtain product data with the postage-free Reader Service Cards provided on pages 209-210. Use them for information on advertised products, too. Just circle the key number appearing at bottom of the ad.

53—ALUMINUM WRENCH is light and extra strong

Designed to meet high strength requirements, this wrench is forged from aluminum bar stock and is described

as approximately 66 per cent lighter than malleable iron wrenches. It is made of Kaiser aluminum alloy 2014 and available in six lengths from 10 to 48 in. with jaw capacities of 1½ to 6 in. Standard models have replaceable insert steel jaws. A safety model with non-sparking beryllium-copper jaws is also available, and all models have a

For more facts circle 613 on Reply Card ——→

Photo Courtesy Simon Holland and Son Company, Inc., Brooklyn, N. Y.

FOR EVERY APPLICATION, THERE'S ONE CRANE OUTSTANDING...

IN METAL FABRICATION: Low-cost, 5-speed, standard-built P&H cranes provide quick, economical handling of a variety of steel shapes in this eastern fabrication shop. This 7½ ton unit has a 55 foot span, but by using I-beam construction, it furnishes fast thru-the-air steel handling with a minimum of dead weight imposed on the runway. This means that the inexpensive first cost is matched with low maintenance costs.

Built with all the care and craftsmanship found in *every* P&H crane, these units are heavyweights in performance, lightweight only in price, and are backed with the famous P&H guarantee of undivided responsibility on *all* structural, mechanical, and electrical parts. *Only* P&H gives you this assurance. Read the details in Bulletin C-51. Write for your free copy to Dept. 104, Harnischfeger Corp., Milwaukee 46, Wisconsin.

P&H

HARNISCHFEGER

...quality and service for 75 years

OUR 75TH YEAR

Photo Courtesy Waukesha Motor Company

...ON A DIME, GENTLY!

WHEN CLOSE SPOTTING IS THE NEED, P&H ZIP-LIFT IS THE STANDARD.

P&H Zip-Lift hoists excel in their ability to spot delicate loads on a dime, quickly — but gently. That's why you'll find Zip-Lifts aplenty . . . hanging over every vital lifting area . . . in this engine manufacturer's plant.

Why Zip-Lift?

First: Zip-Lift is *close-spotting*. Precision spotting of even awkward loads is done with the touch of a button. One hand control operation leaves other hand free to guide the load right to the spot.

Second: Zip-Lift *always works*. Its consistent dependability has been proven in tens of thousands of applications and under the toughest working conditions.

Third: Zip-Lift is *safe*. Workers are protected by a complete line of safety features including dual brakes, shrouded load block, low 24 volt control, and two limit switches that protect worker, load and hoist.

Best of all, Zip-Lift is *priced right* — at no sacrifice of quality.

The complete story on Zip-Lift is yours for the asking in Bulletin H-20. Write Dept. 204, Harnischfeger Corporation, Milwaukee 46, Wisconsin.

OUR 75TH YR.

P&H HARNISCHFEGER

...quality and service for 75 years

NEW PRODUCTS

(Begins on page 152)

tension spring between jaw head and handle. Prices are reported to be comparable to those of similar steel models. Schick Products, Inc.

54—THICKNESS TESTER is small, self contained

Weighing under 5 lb including batteries, probe, harness, cable and earphones the Audigage Model 6 is introduced as the smallest of ultrasonic gages. Self-contained, it is used for nondestructive thickness measurement of most metals, glass, ceramics, and plastics from one side. It is suggested for field inspections of piping, tanks,

pressure vessels, and similar equipment areas where corrosion is suspected.

When a high-sensitivity ceramic transducer is applied to one surface of the material under test, the instrument indicates harmonic resonances by an audible signal in the headphones, and by deflection of a small indicator. Simultaneous computation and conversion of these resonance frequencies to thickness is registered on a panel meter. A principal advantage of the instrument is that it is direct reading. By setting a selector switch to one of three positions, the thickness of steel, aluminum, or copper is determined automatically. A fourth position is provided to permit calibration for other materials. The gauge is 9¾ in. long, and is powered by three standard radio-type mercury batteries. Instrument range is from 0.09 to 5.0 in. Branson Instruments, Inc.

55—ADHESIVE FILM has delayed grasp characteristic

Dulseal is a transparent adhesive film with delayed setting action; it is produced in sheets and rolls and as a mending tape. With its protective wax coating removed, the film becomes just tacky enough to allow approximate positioning. Several hours later it can still be relocated if necessary.

safest !

If the new Remington Captive Stud Tool is accidently fired into inadequate base material...

Captive Stud Guard Assembly prevents free flight of stud, which is locked to tool during firing.

New exclusive guard assembly makes the

Remington Stud Driver

safest powder-actuated tool ever designed

Fast, efficient and now the safest! The Remington Stud Driver with Captive Stud Guard Assembly anchors fastening studs permanently in concrete or steel. But if base material is inadequate, the stud stops short—no danger of free flight!

When you use the Remington Stud Driver with Captive Stud Guard Assembly, you have the convenience of a tool that's powder-actuated...no outside connections needed, no pre-drilling required. Just squeeze the trigger and the stud is set!

Choose from a *complete* selection of studs and Power Loads for all ¼" and many ⅜" fastening applications. You'll save time and money on every job!

Send coupon below for full information about Remington Tools.

CHOOSE THE POWER MOST EFFICIENT FOR YOU. REMINGTON POWER TOOLS ARE AVAILABLE IN **AIR • ELECTRIC • GASOLINE AND POWDER-ACTUATED MODELS**

Remington Arms Company, Inc., Bridgeport 2, Conn.
IN CANADA: Remington Arms of Canada: Limited, 36 Queen Elizabeth Blvd., Toronto 18, Ont.

Remington

DU PONT

---------- FREE POWER TOOL CATALOGS ----------

H-8

Remington Arms Company, Inc., Bridgeport 2, Conn.

Please send—without obligation—catalogs on Remington Contractor & Industrial Tools checked below:

☐ Stud Drivers ☐ Air Tools ☐ Chain Saws ☐ Concrete Vibrators ☐ Electric Tools ☐ Flexible Shaft Machines

*Name*_____ *Position*_____

*Company*_____

*Address*_____

*City*_____ *Zone*_____ *State*_____

For more facts circle 614 on Reply Card

Two Years' Savings Pay For Four Eclipse Boilers

Steady steam pressure improves vulcanizing process at STALWART

Substantial savings and improved operations make Stalwart Rubber Co., Bedford, Ohio, a satisfied Eclipse customer. Savings on these four 100-hp Eclipse gas-fired "Super-Matic" Scotch Steamboilerplants result from two factors: 1. High efficiency of the new units, and 2. substantial reduction in supervisory manpower.

Steady Steaming—High peak demands which previously resulted in a loss in pressure are no longer a problem. The new Eclipse units hold steam pressure constant, insuring higher production rates and more uniform products.

Cleaner, Smoother—The boiler room is cleaner and roomier since the new Eclipse Steamboilerplants went into service. Maximum flexibility and economy of operation are assured, no matter what the load. All four boilers are used in cold weather with two boilers carrying the load in warm weather when plant heating is not required.

Complete Data—Write for catalogs describing and illustrating 11 horizontal and 28 vertical models of Eclipse Steamboilerplants process-engineered to cut costs and boost operating efficiency.

Eclipse **ECLIPSE FUEL ENGINEERING CO.**
1198 Buchanan Street, Rockford, Illinois

For more facts circle 615 on Reply Card

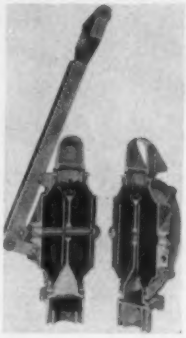
NEW PRODUCTS

(Begins on page 152)

Left untouched for 24 hr, the adhesive sets and forms a permanent bond with paper or cloth to which it is applied. According to manufacturer, the 0.0015-in. thick acetate makes a durable protective coating for documents subject to a lot of handling, in addition to being an excellent mending tape for torn drawings. It is washable, waterproof, and chemically stable—can be used on outdoor notices, too. Duseal's outer surface takes pen, pencil, erasures. Keuffel & Esser Co.

56—HAND PUMP for most industrial liquids

Simplicity of construction and operation impart reliability to the DD-1 a double action pump, it is announced. Special composition diaphragms and valve parts enable handling of a wide variety of liquids, including petroleum products, dilute acids and bases, alcohols, solvents, carbon tetrachloride,



salt solutions, vegetable oils. Fluid is drawn in and discharged on both push and pull strokes, where it passes between diaphragms from intake port at bottom to a discharge spout or hose assembly at the top. Manufacturer points out that the pump itself has no frictional wear points except the shaft bearing, which is isolated from the liquid being pumped. The shaft is stainless steel and the bearing is heavy duty nylon. The double diaphragms have integral O-rings to provide a leakproof seal. Wayne Pump Co., Div., Symington Wayne Corp.

57—SUBMERSIBLE MOTOR for deep well pumps

This 4-in. submersible motor is designed to drive deep well turbine pumps in industrial and other water supply applications. Ratings offered in single phase construction are from 1½ to 5 hp, in three phase construction from 1½ to 7½ hp at 3550 rpm. According to company, greater

"I depend on Distributor Dan," the mechanic told the superintendent. "He always has the bearing we need in stock, even the high-precision bearings we need for key machines. And he knows bearings maintenance. I usually ask purchasing to call him *first*."

All local Authorized SKF Distributors offer you complete bearings service — and immediate delivery from large, diversified stocks of both ball and roller bearings. But find out for yourself. Call the one nearest you next time you need either bearings or service. 5936

Spherical, Cylindrical, Ball, "Tyson" Tapered and REED Miniature Bearings

EVERY TYPE—EVERY USE

SKF®

SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.

®REG. U. S. PAT. OFF.

For more facts circle 616 on Reply Card

(Begins on page 152)

horsepower capacity for its size is achieved by using an outside wound stator. This construction is claimed to permit more effective use of copper and iron for higher efficiency and torques. Motor stator is protected by a high dielectric insulation system, by encapsulation in a chemically inert plastisol and by sealing in stainless steel. Shaft height on motor can be adjusted to center pump impellers. The Louis Allis Co.

58—QUARTZ LAMPS stay bright and clean during their lifetime

Quartzline Lamps never go dim, it is announced. These pencil-thin tubular quartz lamps are based on application of a repeating iodine cycle principle and, watt for watt, are claimed the smallest, brightest, most efficient of incandescent lighting lamps. They will be introduced in 500- and 1500-w sizes—with sample quantities of the former expected to be available this month.

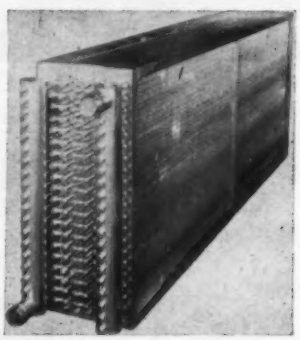
According to manufacturer, Quartzline Lamps offer five major user benefits, including more light from a smaller package—200 times smaller than present lamps of the same wattage. Also, it is pointed out, these lamps clean themselves inside and out, eliminating blackening and reducing dust accumulation. They serve appreciably longer without sacrificing efficiency—reportedly maintaining 99 per cent of their original light output throughout life. They are also said to make possible higher-efficiency high voltage lamps, producing 50 per cent more life throughout life, and to provide more rugged operation under thermal shock.

These lamps consist of a coiled tungsten filament supported at intervals throughout a ⅜-in. diam quartz tube. On each end is a miniature recessed-contact base suitable for push-pull socketing. The 500-w lamps, just over 4½ in. long, operate on standard 120-v power, producing 10,500 lumens. The 1500-w lamp is about 10 in. long, for 277-v operation and is rated at 33,000 lumens. Rated life of both lamps is 2000 hr.

The iodine cycle utilized is described as a regenerative, continuing process which catches the tungsten particles that evaporate from an incandescent lamp filament and puts these particles back on the filament. In other filament lamps, these particles mass on the bulb and cause a gradual loss of light output. Quartzline Lamps must be used horizontally and operate at relatively high temperatures which require screening from accidental contact. Under normal conditions they need no cleaning in service, since their heat incinerates most dust particles settling on them. General Electric Co.

59—WATER-COOLING COILS can be kept clean

Sediment buildup can be avoided with these cleanable chilled water-cooling coils—a worthwhile advantage in air conditioning installations where bad



water conditions are encountered. They feature company's Turbo-Flo fins to provide extra heat transfer capacity. The embossed, streamlined pattern in-

LOOK!

LOGAN HAS IT!

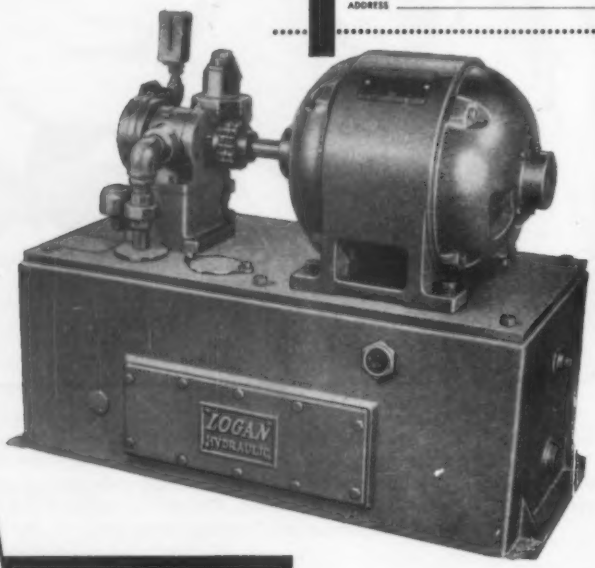
RIGHT PRICE
TOP QUALITY
PEAK PERFORMANCE

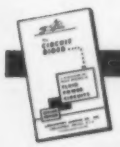
In hydraulic power devices

LOGANSPORT MACHINE CO., INC.
838 CENTER AVENUE, LOGANSPORT, INDIANA

PLEASE SEND COPY OF CATALOG:
☐ 100-1 AIR CYLINDERS
☐ 100-2 MILL-TYPE AIR CYLS.
☐ 100-3 AIR-DRAULIC CYLS.
☐ 100-4 AIR VALVES
☐ 100-5 LOGANSQUARE CYLINDERS
☐ 100-6 ULTRAMATION CYLINDERS
☐ 300-2 PRESSES
☐ FACTS OF LIFE
☐ 200-1 HYD. POWER UNITS
☐ 200-2 BOTOCAST HYD. CYLS.
☐ 200-3 730 SERIES HYD. CYLS.
☐ 200-4 AND 200-7 HYD. VALVES
☐ 200-6 SUPER-MATIC CYLS.
☐ 300-1 CHUCKS
☐ ABC BOOKLET
☐ CIRCUIT RIDER

TO:
NAME _____ TITLE _____
COMPANY _____
ADDRESS _____





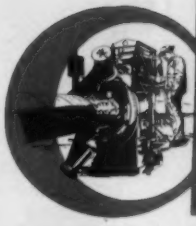
FREE SEND FOR YOUR COPY OF THE LOGAN "CIRCUIT RIDER"
A 32-page manual on fluid power circuits (fifth edition) completely revised to present current engineering trends.
MEMBERS: Natl. Mach. Tool Builders' Assn.; Natl. Fluid Power Assn.

ILLUSTRATED—LOGAN MODEL 6035 HYDRAULIC POWER UNIT

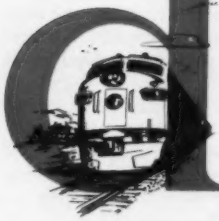
For more facts circle 617 on Reply Card

dearborn *research leads the way in all fields of corrosion control*

Chances are you're using one or more Dearborn products now. Perhaps it's SAFEGARD*—the revolutionary non-flammable production coating for finished metal parts . . . or the newest condensate return line treatment, SUPER FILMEEN® in flake form, which obsoletes all other filming amines. Whatever the corrosion problem, industry naturally looks to Dearborn for the best answers.



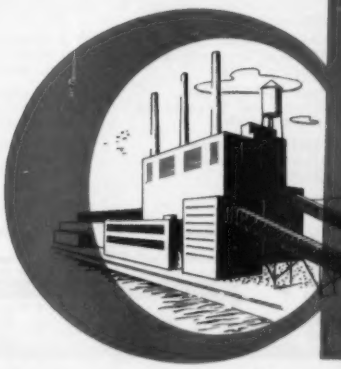
PIPE LINE *corrosion specialists call for both mechanical and chemical protection and get it with Dearborn's NO-OX-ID* coatings and wrappers . . . underground and underwater protection that lasts for decades.*



ON RAILROADS, *Dearborn's water treatment formulas and sludge solvents keep diesels running longer and cleaner. NO-OX-ID* coatings add years of life to trestles and bridges. Exclusive pressure washing systems and cleaners keep rolling stock bright . . . reduce maintenance costs.*

SHIP OWNERS *depend on Dearborn's NO-OX-ID* coatings for long term protection against the continuous corrosive attack of inland and salt waters.*

POWER ENGINEERS *in all types of industry keep costly boiler down-time and repairs at a minimum . . . maintain trouble-free cooling systems . . . with Dearborn water treatment consulting service and test equipment engineered to their specific needs. Dearborn engineers also assist in designing pre-treatment systems including ion-exchange equipment, demineralizers and softeners.*



If your responsibilities include any phase of water treatment or corrosion control, you should be receiving Dearborn's valuable research and technical bulletins. A request on your Company letterhead will bring them regularly.

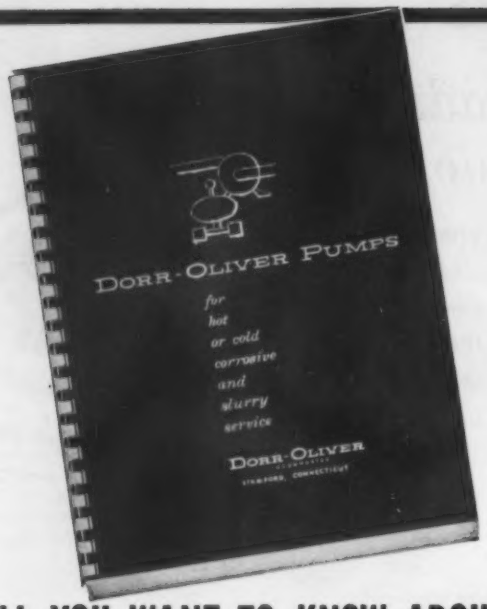
DEARBORN CHEMICAL COMPANY

Executive Offices: Merchandise Mart, Chicago 54
Plants and Laboratories: Chicago • Linden, N. J. • Los Angeles
Toronto • Honolulu • Havana • Buenos Aires

pioneer in the science of corrosion control

*Registered trade mark of Dearborn Chemical Company

For more facts circle 618 on Reply Card



ALL YOU WANT TO KNOW ABOUT PUMPS

for corrosive and slurry service

Complete engineering data — dimensions, performance curves, parts lists and specifications on the entire Dorr-Oliver line of alloy metal, lined and diaphragm-type pumps — *all in one big bulletin!* Here's everything you need to solve difficult pumping problems . . . just off the press!

Write for your copy now, or contact the fully qualified Dorr-Oliver representatives and distributors listed below.

REPRESENTATIVES AND DISTRIBUTORS

Equipment Engineers Inc.
331 E. Lancaster Ave., Wynnewood, Pa.
Tel.: Trinity 7-2539

John J. Round Company
25 Wing Rd., Lynnfield Center, Mass.
Tel.: LYnnfield 4-4950

Chemical Pump & Equipt. Corp.
75 West St., New York 6, New York
Tel.: BO 9-7544

The Cunningham Company
101 Investment Bldg., Pittsburgh, Pa.
Tel.: Court 1-7092

Chemical Pump & Equipt. Corp.
3537 Lee Road, Cleveland, Ohio
Tel.: Longacre 1-3025

Chemical Pump & Equipt. Corp.
565 West Washington Blvd., Chicago, Ill.
Tel.: ANdover 3-1881

Chemical Pump & Equipt. Corp.
1717 Section Road, Cincinnati, Ohio
Tel.: ELmhurst 1-5765

Shutt Process Equipment Corp.
5627 Manchester Ave., St. Louis, Mo.
Tel.: Mission 7-0908

Simonds Machinery Company
816 Folsom St., San Francisco, Calif.
Tel.: DOuglas 2-6794

Kerr Machinery Company
Kerr Bldg., Corner of Ft. and Beaubien Sts.
Detroit, Michigan
Tel.: Woodward 1-0590

The Galigher Company
545 W. 8th South St., Salt Lake City, Utah
Tel.: Elgin 9-8731

The O'Neill Pump & Engineering Co.
601 E. Franklin St., Richmond, Va.
Tel.: Milton 4-4828

R. V. Gildersleeve Company
P. O. 2623, Baton Rouge, La.
Tel.: Dickens 3-2338

Ritteimeyer & Company Inc.
150 Nassau Street N.W., Atlanta 1, Ga.
Tel.: Jackson 4-1531

Brown & Morrison
207 Liberty Life Bldg., Charlotte 2, N. C.
Tel.: Ed 3-0774

M. N. Dannenbaum Company
P. O. 14496, Houston 21, Texas
Tel.: Walnut 3-7655

Paco Engineering Company
6578 Broadway, Alden, New York
Tel.: Regent 3526 (Buffalo)

Simonds Pump Company
455 East 4th St., Los Angeles, Calif.
Tel.: MUtual 8321

DORR-OLIVER
INCORPORATED
WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT
STAMFORD • CONNECTICUT • U.S.A.

For more facts circle 619 on Reply Card

NEW PRODUCTS

(Begins on page 152)

creases fin surface and improves air wash. This is claimed to step up heat transfer up to 15 per cent. Secondary and primary surfaces are balanced for efficiency and low air friction. Seamless copper tubing, ⅝ in. OD, is spaced on 1½-in. centers.

Standard coils use in-line tubes, but staggered tubes can be furnished. Turbo-Flo aluminum fins are permanently bonded to the tubes by mechanical expansion of the tubes, it is noted. Coils are available with finned surface heights from 12 to 36 in., lengths from 24 to 120 in. They can be built with one to eight rows, and with fins running six to 10 to the inch. Halstead & Mitchell.

60—DIFFUSER PANELS of non-combustible plastic

Plastic Gratelite Louver Diffuser Panels, ⅜-in. open cubicle type, are now offered in non-combustible types. They are compression molded of a non-combustible plastic in 2-by-2 ft modules with a UL listed flame spread rating of only 25, it is announced. This material is described as one of the hardest plastics known. According to company it won't sag, warp or bend, is scratch resistant, repels dust and stays whiter and cleaner longer. The panels are supported in 2-by-2 ft module suspension system; they are UL listed for use under sprinkler systems and can be cut on the job. Louver vanes are on ⅜ in. center and ⅜ in. deep to provide 45-by-45 deg shielding. Edwin F. Guth Co.

61—PLASTIC LABELS indicate surface temperatures

Calibrated to give an irreversible registration of temperature, the Temp-Plate is announced for indication from 100 through 700 F, in a choice

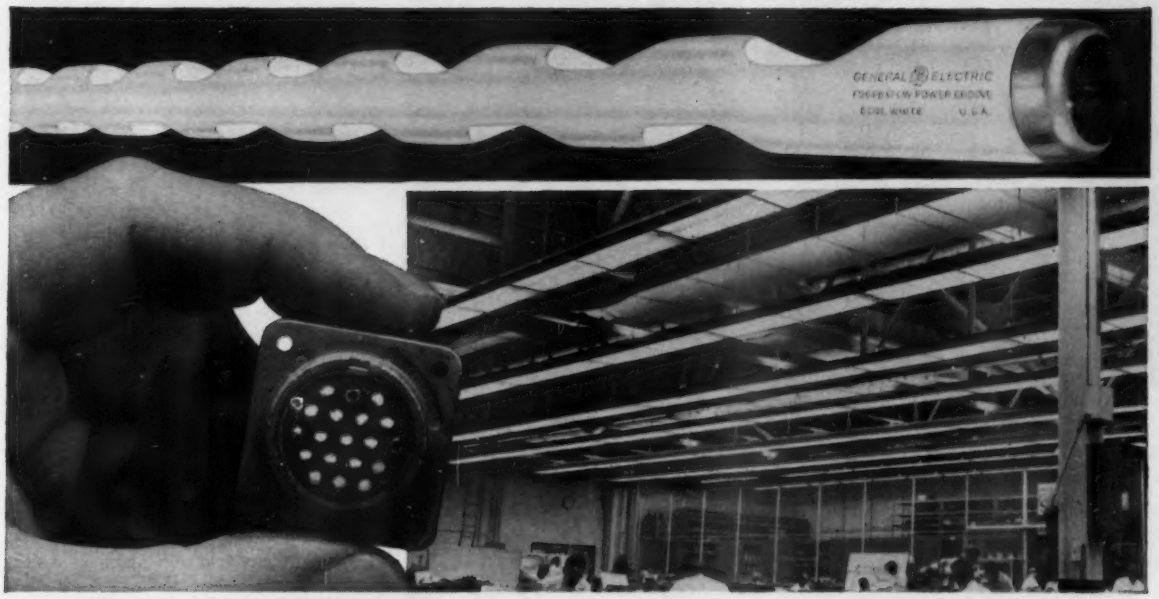
of 50 increments, with accuracy of ± 1 per cent. The small plastic label, backed with adhesive for simple application, is designed to register a permanent change from white to black as the stated temperature level is reached, and to adhere to the mounting surface under a wide range of exposure conditions until unintentionally removed. Pyrodyne, Inc.

How's this for results?

General Electric Power Groove Lamps help Grumman get 60% fewer rejects of electronic wiring harness!

BETHPAGE, L.I., NEW YORK Startling statistics come from Grumman Aircraft Engineering Company—concerning their year-old lighting system. G-E Power Groove Lamps are delivering a steady 140 footcandles at bench height. The result is a 60% reduction in rejects of Grumman's delicate wiring harness (held below). And the general lighting is *so shadow-free that individual bench lighting isn't needed.* Grumman switched to G-E Power Grooves because this lighting level would have cost about 20% more with 40-watt fluorescents . . . over-all cost of installation and operation would have been 10% higher. And *today's* General Electric Power Groove Lamps provide even greater savings.

1959 POWER GROOVE General Electric's all new Power Groove Lamps are ideally suited for applications where a high lighting level is desired because they deliver even more light than those first installed by Grumman—saving up to 40¢ a square foot initial investment over other types of fluorescents. G-E Power Grooves not only deliver more light at the start (15,000 lumens for the 8-foot length), but they have a high *maintained* light ouptut as well over their long useful life. For more information on the lamps, or any of the installations listed, call your General Electric Large Lamp Salesman, or write: General Electric Co., Large Lamp Dept. C-930, Nela Park, Cleveland 12, Ohio.



Grumman engineers Al Ridgeway (left) and Ed Smiddy were instrumental in getting G-E Power Groove Lamps specified in the company's plant in Bethpage. Pleasant light eliminated complaints of eye strain or headache.

PARTIAL LIST OF SATISFIED POWER GROOVE USERS

Bell Telephone Laboratories	Murray Hill, N.J.
Boeing Airplane Co.	Seattle, Wash.
Convair San Diego, Div. of General Dynamics	San Diego, Cal.
Cooper Bessemer Corp.	Mt. Vernon, Ohio
Eastman Kodak Co.	Rochester, N.Y.
Erickson Tool Co.	Solon, Ohio
Fruehauf Trailer Co.	Decatur, Ala.
General Iron & Metal Corp.	Chicago, Ill.
International Business Machines	Mechanicsburg Pa.
Johnson-Hill's Dept. Store	Wisconsin Rapids, Wisc.
Pla-Mor Bowling Lanes	Kansas City, Mo.
Shafer Valve Co.	Mansfield, Ohio
Southwestern Industrial Electronics Co.	Houston, Tex.

Progress Is Our Most Important Product

GENERAL ELECTRIC

For more facts circle 620 on Reply Card

New Plant Construction

(Continued from page 138)

rate at company plant located here. Program includes construction of several new buildings, two of which are already under construction and installation of new production equipment.

Altoona, Pa.—SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa., plans large expansion program of company's ball bearing plant here estimated to cost about $4.5 million. Program will involve construction of 160,000 sq ft of administrative and manufacturing space, with completion scheduled for the early part of 1960.

Bradford, Pa.—Quaker State Oil Refining Co., Oil City, Pa., has authorized expenditure of approximately $400,000 for expansion of its refinery at Farmers Valley, located near here. Expansion, slated for completion late this year, will boost production of company products by about 18 per cent.

Butler, Pa.—Armco Steel Corp., 1939 Armco Ave., Middletown, O., plans major expansion of company's Butler Works, located here, which will include a program for additional stainless steel facilities to cost an estimated $17 million. Work will begin at once for the installation of new machinery and equipment and building improvements.

Columbia, Tenn.—Monsanto Chemical Co., 1700 S. Second St., St. Louis, Mo., plans major expansion, improvement and modernization program at company's phosphorus plant located here. Plans include construction of facilities for the prevention of air and stream pollution and new units for the processing of phosphate rock.

Memphis, Tenn.—E. I. du Pont de Nemours Co., Nemours Building, Wilmington, Del., will start construction immediately on a new plant here for the production of acrylonitrile, a key raw material for company's "Orlon" acrylic fibre.

Nashville, Tenn.—Ferro Corp., Harvard and E. 56th Street, Cleveland, O., plans major addition and expansion of company's glass fiber plant located here. This is the second expansion approved for the plant this year. Work will get under way at once for completion by the end of 1960. Cost reported to be about $700,000.

Houston, Texas—Shell Chemical Corp., 380 Madison Ave., New York, N. Y., has announced that major concrete and structural steel foundations have been completed for its new chemical unit. Plant will produce phenol along with acetone as a coproduct. Plant is scheduled for completion by the first of next year, under the direction of M. W. Kellogg & Co., Chemical Division, Jersey City, N. J.

Sulphurdale, Utah.—Dixon Chemical & Research, Inc., and American Sulphur & Refining Co., have announced the formation of Dixon-Western Chemicals, Inc. The new jointly owned company plans to construct a 500-ton-per-day sulphuric acid plant on American Sulphur's 15,000 acre sulphur properties located here. Plant when completed late in 1961 will represent an investment of $3.5 million.

Mead, Wash.—Kaiser Aluminum & Chemical Corp., 1924 Broadway, Oakland, Calif., plans to triple company's capacity to produce super purity aluminum by building two new refining cells at company's local refinery. The cells which refine the metal to a purity of more than 99.99 per cent are expected to be placed in operation by early 1960 and will increase productive capacity to 900,000 lb annually.

Waxdale, Wis.—S. C. Johnson & Co., Racine, Wis., plans to construct a plant here for the manufacture of company's aerosol products. New unit, reported to represent an investment of approximately $1 million, is part of company's current $4-million expansion program scheduled for completion by mid-1960.

VP-EX PROPELLER-TYPE

belted roof ventilator

Self-contained VP-Ex belted roof ventilator

Standard heavy-duty type belted propeller fan

The outstanding performance of the VP-Ex Belted Roof Ventilator is derived from insistence on quality at every step—from its galvanized construction through its complete industrial-type propeller fan. Capacities from 4450 CFM to 33900 CFM; also available in smaller direct drive sizes.

Send for Bulletin 582.

nyb THE NEW YORK BLOWER COMPANY

SALES OFFICES: 2163 S. SHIELDS AVENUE • CHICAGO 16

For more facts circle 621 on Reply Card

with A.W. ALGRIP abrasive flooring

Put A. W. ALGRIP underfoot in your plant . . . you'll get safety and sure-footedness. A. W. ALGRIP eliminates sliding and slipping . . . gives you assured footing under the most dangerous plant conditions . . . on inclined as well as flat surfaces.

A. W. ALGRIP rolled steel floor plate is produced by Alan Wood Steel Company by a patented process in which an abrasive – just like the kind that is used in grinding wheels – is embedded to a specified depth. It becomes an integral part of a tough steel plate.

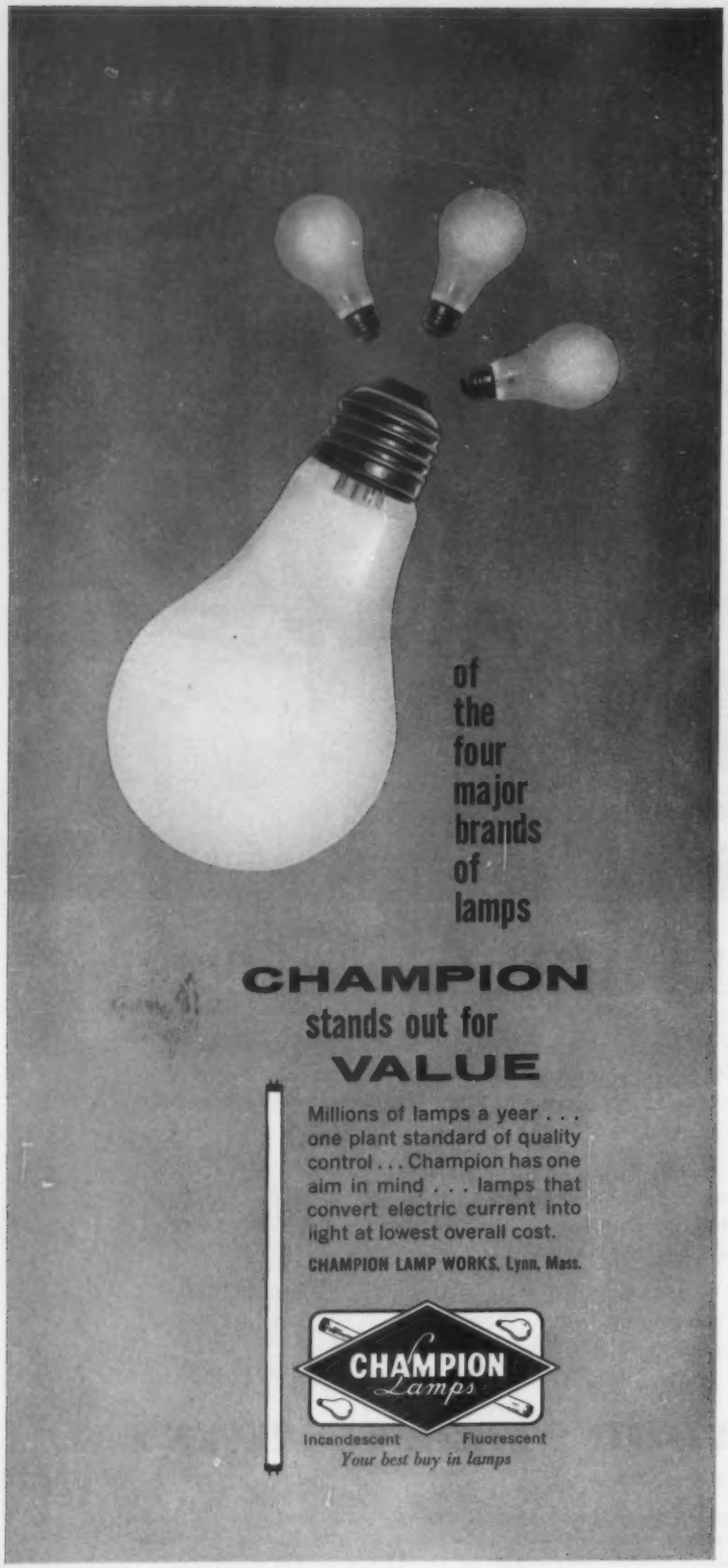
A. W. ALGRIP can be used as independent flooring . . . or as flooring overlay. Put your plant on a safe footing, with A. W. ALGRIP . . . Approved for Safety by Underwriters' Laboratories. Write for Bulletin **AL-N4.**

ALAN WOOD STEEL COMPANY

CONSHOHOCKEN, PA.

DISTRICT OFFICES: Philadelphia • New York • Los Angeles • REPRESENTATIVES: Atlanta • Boston • Buffalo Cincinnati • Cleveland • Detroit • Houston • Pittsburgh • Richmond • St. Paul • San Francisco • Seattle Montreal, Toronto and Vancouver, Canada—A. C. Leslie & Co., Ltd.

For more facts circle 622 on Reply Card



For more facts circle 623 on Reply Card

School for USAF's Plant Engineers

(Continued from page 117)

average of one visit per month in the advanced course. In the basic course there is usually only one trip scheduled for each nine-week course and, naturally, these visits are confined to other Air Force bases in order that the students may actually see a base engineer organization in operation. The advanced course, however, is more interested in the latest equipment and practices; consequently, their visits are planned to show industrial advancements.

The faculty of the Civil Engineering Center is composed of selected officers who possess a high degree of professional competency in their field and who have received special training in the particular subjects which they teach. Professors from the University of Dayton and Miami University augment this military faculty and guest lecturers are frequently invited.

The Civil Engineering Center is one of the more important management tools being employed to increase the abilities of the Air Force Civil Engineer. Future problems must be met and solved; procedures and practices must be developed to keep pace with technological advancements; equipment must be designed and employed which will facilitate the accomplishment of the Air Force mission. The Civil Engineering Center strives to present formal education which, in connection with continued self-study, will produce officers capable of successfully accomplishing this vitally important mission. **End**

"For efficiency and dedication . . ."

NEW Solenoid Valve V-4019

for water and other light fluids

small in size, high in capacity

APPROXIMATE CAPACITY, GALLONS PER MINUTE, WATER SERVICE

Differential Pressure (psi)	1.25	3	5	10	30	40	50	100
½" Valve	5.6	8.7	11.3	15.6	27.3	31.6	35.2	50
¾" Valve	7.8	12.1	15.6	21.9	38.2	44.2	49	70

Pressure Ratings: Operating pressure—100 psi max.; 1¼ psi min. for full flow. Body rating: 150 psi, nominal body rating

Fluid Temperature Ratings: 125 F max. at 125 F ambient
175 F max. at 77 F ambient

Capacity Index (C_v): ½" size—5, ¾" size—7

Electrical Rating: 120, 208, 240 volt, 50 and 60 cycle ac

Use this pilot-operated, soft-seated solenoid valve for reliable on-off control of water or other light, non-viscous non-corrosive fluids. It's of floating-piston design for quiet operation. The power head can be rotated 360° for ease of wiring. Body material is brass. Can be used for normal and chilled water applications . . . operates from any standard SPST controller or on-off switch.

Get complete details from your nearby Honeywell field engineer. Call him today . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL, Wayne and Windrim Avenues, Philadelphia 44, Pa.

Honeywell

First in Control

NEW BOOKS

for the plant engineer

Plant Engineering, Maintenance

TECHNIQUES OF PLANT MAINTENANCE AND ENGINEERING. Size 8¼ by 11 in. 266 pp; cloth bound. Published by Clapp and Poliak, Inc., 341 Madison Ave., New York 17, N. Y. Price $10.00.

PRESENTED HERE, in the tenth bound volume of the annual series, are reports on the papers at the 1959 Plant Maintenance and Engineering Conference. The conference was held in Cleveland in January. In addition to the papers, numerous questions from plant engineers attending the conference, along with answers from the speakers, are included.

Of value to many readers will be the reports of sessions confined to single industries. These include discussions on maintenance in nuclear plants, research and development laboratories, assembly and chemical plants, electrical manufacturing plants and petroleum refineries.

A list of several of the papers will give you some idea of the type of material you will find in this tenth volume: Maintenance Materials; Economical Use of Electric Power; Setting and Maintaining Sanitation Objectives; Maintaining Plant Utilities; and Basic Procedures in Building Maintenance.

Electrical Tips

MAINTENANCE HINTS. Size 7½ by 5 ¾ in.; over 600 pp; illustrated; loose-leaf holder. Available from J. M. Pritchard, Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 2278, Pittsburgh 30, Pennsylvania. Price $2.00.

THIS POPULAR electrical maintenance manual is loaded with information handy to have around a plant engineering department. It covers a wide range of subjects. Some of these are: commutator maintenance, bearings, transformers, static controls, industrial electronics, electric brakes, insulation cleaning and drying, and safety rules.

An entire chapter deals with tables and formulas. It includes an extensive listing of graphical symbols for electrical diagrams, tabulated data on copper and aluminum conductors, power factor correction, overcurrent protection for motors, and other helpful material.

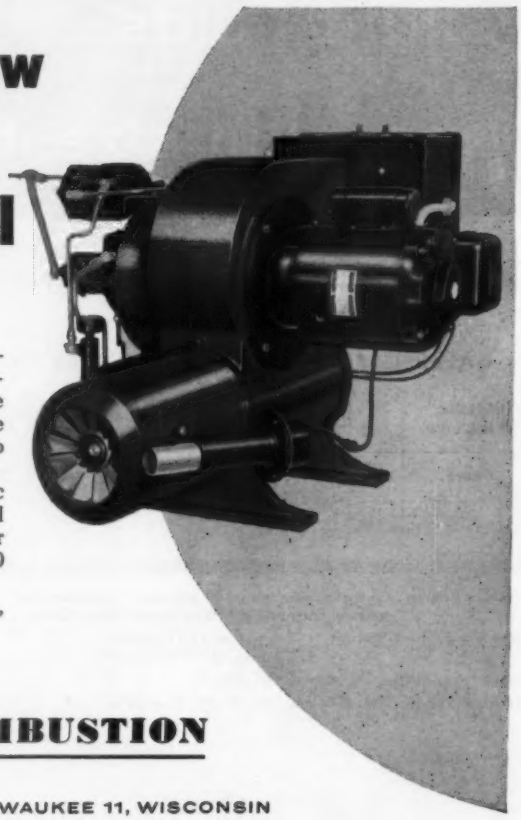
Fluid Power Diagrams

AMERICAN DRAFTING STANDARDS MANUAL—ASA Y14.17-1959. Size 11 by 8½ in.; 24 pp including index; illustrated; paper bound. Published by the American Society of Mechanical Engineers, 29 West 39th St., New York 18, N. Y. Price $1.50.

PLANT ENGINEERS can look to this standard for guidance on the use of symbols for fluid (liquid and gas) power systems. At the beginning of the booklet there is a comparative study of four different types of diagrams of the same system, namely, pictorial, cutaway, graphical, and combination of features of the other illustrations. Other more complete drawings are presented at the end of the manual.

Proper use of various kinds of lines is also covered in the text as well as by illustrations. Component data such as capacity, rpm, hp is of course desirable information to have on a diagram. The booklet includes examples of the use of component information

Keep heating costs low with HEV-E-OIL commercial-industrial burners



Hev-E-Oil burners furnish all the air necessary for combustion, assuring perfect fire control under all weather conditions. Low fire start that builds up gradually to the flame size required means smooth, safe operation. And once the burner is set for greatest efficiency, it *stays* that way no matter what the weather.

A complete package! Fire tested! Automatic, electronic controls. Meets all codes. Easy to install . . . Hev-E-Oil models from 5 to 150 gph. Also available, Hev-E-Duty power gas burners and combination gas/oil burners from 720,000 to 21,000,000 B.T.U.

For more information write Industrial Combustion, Inc., 4507 N. Oakland Ave., Milwaukee 11, Wis., Dept. PE-859.

INDUSTRIAL COMBUSTION INC.

EXECUTIVE OFFICE: 4507 N. OAKLAND AVE., MILWAUKEE 11, WISCONSIN

For more facts circle 625 on Reply Card

THIS IS WHERE *dependability counts for Induced Draft Fan*

DeBothezat Induced Draft Bifurcator Fan with motor speed controller installed in unattended AT&T radio relay tower.

This installation of a DeBothezat Induced Draft Bifurcator® is typical of numerous others in unattended radio relay towers of the American Telephone and Telegraph Company. A dependable, controlled draft helps maintain correct temperatures that safeguard the performance of sensitive electronic equipment.

This Induced Draft Fan utilizes a direct motor drive which eliminates any chance for belt failure. The fan motor mounts in a separate insulated chamber and hot flue gases are bypassed around it.

DeBothezat Induced Draft Bifurcator Fans install just like a section of breeching or duct-work. This saves on space and installation costs.

Bifurcators can be equipped with motor speed controllers which regulate draft according to exact boiler requirements.

For more details, see our section in Sweet's Plant Engineering File . . . or write.

De Bothezat™ FANS

A DIVISION OF

American Machine and Metals, Inc.

EAST MOLINE, ILLINOIS

FOR FURTHER INFORMATION SEE OUR CATALOG IN SWEET'S PLANT ENGINEERING FILE OR WRITE FOR COPY

IN CANADA: Represented by DOUGLAS ENGINEERING CO., LTD., Toronto • Montreal

For more facts circle 626 on Reply Card

big name
in the
small pump field

Ingersoll-Rand

MOTORPUMP

FOR MORE THAN 90 YEARS Ingersoll-Rand pumps have been demonstrating that highest quality construction means low-cost pumping efficiency.

Modern, compact Motorpumps—designed in a wide range of types and sizes, and *always* available—are meeting requirements in hundreds of varied installations.

Motorpumps will deliver from 5 to 2800 gallons per minute. They operate in any position and save valuable floor space as well. Write today for complete catalog data.

9-825

Ingersoll-Rand

11 Broadway, New York 4, N. Y.

For more facts circle 627 on Reply Card

NEW BOOKS

and discussion on the presentation of data. It also has a section on operation, installation and general notes.

Putting Metals Under Vacuum

VACUUM METALLURGY. Edited By Rointan F. Bunshah. Size 6 by 9 in.; 472 pp including index; cloth bound. Published by Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y. Price $12.50.

VARIOUS PHASES of vacuum technology as applied to metals are covered in this book. All facets dealing with the making, shaping, and treating of metals and alloys under vacuum or reduced pressures along with their evaluation and utilization are discussed. The material is based on a series of lectures presented at New York University.

A discussion of vacuum equipment is the first chapter and introduces you to the rest of the material. After this the author covers such subjects as: Thermodynamics and Kinetics; Arcs and Arc Melting Processes; Induction Melting Processes; Electron Bombardment Melting Techniques; Degassing in the Liquid and Solid States; Distillation of Metals; Metallurgical Application of Vacuum Processing and Analytical Techniques. At the end of the book he offers some suggestions as to possible future trends in this field.

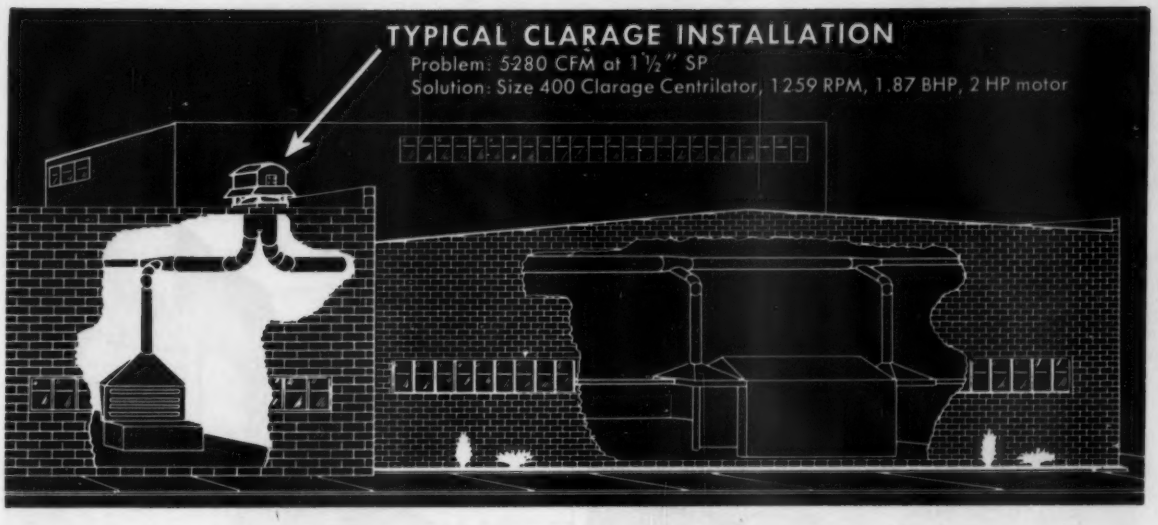
On Grinding

THE GRINDING WHEEL by Kenneth B. Lewis. Size 9¾ by 6⅝ in. 527 pp including index; illustrated; cloth bound. Published by the Grinding Wheel Institute, 2130 Keith Building, Cleveland 15, Ohio. Price $4.95.

THE 1951 EDITION of the Grinding Wheel was revised by William F. Schleicher and material was added resulting in this current edition. New chapters in this book are titled as follows: mounted wheels, reinforced wheels, automation and advanced mechanization, and safety.

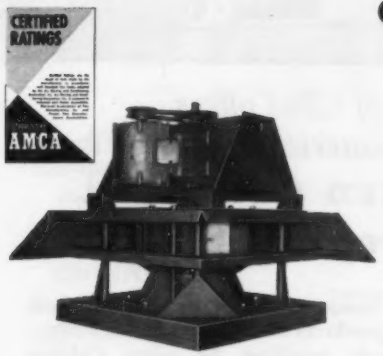
Among the other principal topics of the 32 chapters are the following: fundamentals of grinding, crush forming and form grinding, thread grinding, crank and cam finishing, tool and cutter sharpening, roll grinding, grinding non-metallics, and costs.

In the appendix is a wheel recommendation table extending over 16 pages. This table deals with workmaterials, types of grinding, and the corresponding recommended abrasive with grain size, grade and bond.


TYPICAL CLARAGE INSTALLATION
Problem: 5280 CFM at 1½" SP
Solution: Size 400 Clarage Centrilator, 1259 RPM, 1.87 BHP, 2 HP motor

Demonstrating...

how to save space and money on your next air handling jobs



V-belt driven centrifugal type with backwardly inclined blade wheel. 10 sizes. Capacities from 1,500 to 26,500 CFM. (Shown above with weather enclosure and two sides of air apron removed.)

YOURS... ALL YOURS... with the Clarage Centrilator®* power roof ventilator. Handles static resistances to 2". Requires no floor space. Minimum installation cost. Unequalled accessibility. High efficiency for low operating cost. Ideal solution for numerous industrial systems such as the one shown above.

Get full information on the Clarage Centrilator and its exclusive Jet Siphon tm. Air Flow Director feature. Request Bulletin 550 or contact the nearest of our 58 sales engineering offices today. CLARAGE FAN COMPANY.

* Patent applied for

Dependable equipment for making air your servant

CLARAGE

Kalamazoo, Michigan

For more facts circle 628 on Reply Card

Complete with 1 Universal Die Head, 2 Sets of Dies for ½" to 2" pipe or conduit

Looks good, does better. Perfect cutting, reaming, threading fast . . . and easy! Three tools operate independently . . . swing up out of the way for short pipe chucking from front. Slip-proof Speed Chuck is a great performer. Concealed oil system, automatic shut-off nozzle. Quick-opening die head sets to size right in machine. Power?. . . RIDGID-built motor handles 2" pipe, conduit, bolt, rod—and 12" geared tools easily. Try it, compare it . . . and you'll understand its enormous popularity! Leg and wheel stands available. At your Supply House.

The Ridge Tool Company Elyria, Ohio, U.S.A.

THREADED PIPE...It's Tight...It's Best...Costs Less!

For more facts circle 629 on Reply Card

The Image of CF&I offers Safe, fast materials handling with

Coburn Overhead Conveying Systems

The CF&I Image stands for the quality of all CF&I steel products made for general industry. For materials handling, he offers Coburn Overhead Conveying Systems because they speed up the spotting of work over machines . . . help eliminate damaged goods resulting from multiple handling. Coburn systems are made from high quality steel, yet they are inexpensive as the sectional design can be adapted to any plant.

There's no installation problem. In fact, the design is so simple and practical that your own plant personnel can install the Coburn system.

CF&I-Coburn also makes a full line of sliding door and fire door hardware. For complete information on these CF&I products, write to Coburn Sales and Engineering, P. O. Box 311, Palmer, Mass.

6604

CF&I STEEL

COBURN PRODUCTS

THE COLORADO FUEL AND IRON CORPORATION
WICKWIRE SPENCER STEEL DIVISION

For more facts circle 630 on Reply Card

FIRST CLASS
PERMIT No. 11
BARRINGTON, ILL.

BUSINESS REPLY MAIL
No Postage Stamp Necessary If Mailed In the United States

Postage will be paid by

PLANT ENGINEERING
308 East James St.
BARRINGTON, ILLINOIS

AUGUST, 1959
This card good only until November 30, 1959

PLANT ENGINEERING

Please have manufacturers send without obligation information or bulletins indicated by numbers circled.

(Please print or typewrite)

Your Name..... Your Title.....

Your Company Name.....

Company Address.....City..... State.....

(Company name must be given. If you prefer delivery at home, also fill below)

Home Address.....City..... State.....

PRODUCTS

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	32	33	34	35
36	37	38	39	40	41	42
43	44	45	46	47	48	49
50	51	52	53	54	55	56
57	58	59	60	61	62	63
64	65	66	67	68	69	70
71	72	73	74	75	76	77
78	79	80	81	82	83	84
85	86	87	88	89	90	91

BULLETINS

101	102	103	104	105	106	107	108	109	
110	111	112	113	114	115	116	117	118	
119	120	121	122	123	124	125	126	127	
128	129	130	131	132	133	134	135	136	
137	138	139	140	141	142	143	144	145	
146	147	148	149	150	151	152	153	154	
155	156	157	158	159	160	161	162	163	
164	165	166	167	168	169	170	171	172	
173	174	175	176	177	178	179	180	181	
182	183	184	185	186	187	188	189	190	
191	192	193	194	195	196	197	198	199	
200	201	202	203	204	205	206	207	208	
209	210	211	212	213	214	215	216	217	

DATA FILE

301	302	303	304	305	306	307	308	309	310	311	312	313	314	315
316	317	318	319	320	321	322	323	324	325	326	327	328	329	330
331	332	333	334	335	336	337	338	339	340	341	342	343	344	345
346	347	348	349	350	351	352	353	354	355	356	357	358	359	360
361	362	363	364	365	366	367	368	369	370	371	372	373	374	375
376	377	378	379	380	381	382	383	384	385	386	387	388	389	390
391	392	393	394	395	396	397	398	399	400	401	402	403	404	405
406	407	408	409	410	411	412	413	414	415	416	417	418	419	420
421	422	423	424	425	426	427	428	429	430	431	432	433	434	435
436	437	438	439	440	441	442	443	444	445	446	447	448	449	450
451	452	453	454	455	456	457	458	459	460	461	462	463	464	465
466	467	468	469	470	471	472	473	474	475	476	477	478	479	480
481	482	483	484	485	486	487	488	489	490	491	492	493	494	495

ADVERTISED PRODUCTS, SERVICES

501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532
533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564
565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596
597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628
629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660
661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692
693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724
725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756

Use this space to ask for tear sheets, other information wanted. .....

AUGUST, 1959
This card good only until November 30, 1959

PLANT ENGINEERING

Please have manufacturers send without obligation information or bulletins indicated by numbers circled.

(Please print or typewrite)

Your Name..... Your Title.....

Your Company Name.....

Company Address..... City..... State.....

(Company name must be given. If you prefer delivery at home, also fill below)

Home Address..... City..... State.....

PRODUCTS

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	32	33	34	35
36	37	38	39	40	41	42
43	44	45	46	47	48	49
50	51	52	53	54	55	56
57	58	59	60	61	62	63
64	65	66	67	68	69	70
71	72	73	74	75	76	77
78	79	80	81	82	83	84
85	86	87	88	89	90	91

BULLETINS

101	102	103	104	105	106	107	108	109	
110	111	112	113	114	115	116	117	118	
119	120	121	122	123	124	125	126	127	
128	129	130	131	132	133	134	135	136	
137	138	139	140	141	142	143	144	145	
146	147	148	149	150	151	152	153	154	
155	156	157	158	159	160	161	162	163	
164	165	166	167	168	169	170	171	172	
173	174	175	176	177	178	179	180	181	
182	183	184	185	186	187	188	189	190	
191	192	193	194	195	196	197	198	199	
200	201	202	203	204	205	206	207	208	
209	210	211	212	213	214	215	216	217	

DATA FILE

301	302	303	304	305	306	307	308	309	310	311	312	313	314	315
316	317	318	319	320	321	322	323	324	325	326	327	328	329	330
331	332	333	334	335	336	337	338	339	340	341	342	343	344	345
346	347	348	349	350	351	352	353	354	355	356	357	358	359	360
361	362	363	364	365	366	367	368	369	370	371	372	373	374	375
376	377	378	379	380	381	382	383	384	385	386	387	388	389	390
391	392	393	394	395	396	397	398	399	400	401	402	403	404	405
406	407	408	409	410	411	412	413	414	415	416	417	418	419	420
421	422	423	424	425	426	427	428	429	430	431	432	433	434	435
436	437	438	439	440	441	442	443	444	445	446	447	448	449	450
451	452	453	454	455	456	457	458	459	460	461	462	463	464	465
466	467	468	469	470	471	472	473	474	475	476	477	478	479	480
481	482	483	484	485	486	487	488	489	490	491	492	493	494	495

ADVERTISED PRODUCTS, SERVICES

501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532
533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564
565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596
597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628
629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660
661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692
693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724
725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756

Use this space to ask for tear sheets, other information wanted. .....

FIRST CLASS
PERMIT No. 11
BARRINGTON, ILL.

BUSINESS REPLY MAIL
No Postage Stamp Necessary If Mailed in the United States

Postage will be paid by

PLANT ENGINEERING
308 East James St.
BARRINGTON, ILLINOIS

BULLETINS

(Begins on page 21)

145 **Improved Hoist**—Complete information on five models of a new sealed ratchet lever hoist is provided in Bulletin ADH-78. Lists specifications and features of these hoists ranging from ¾- to 6-ton capacities. Coffing Hoist Div., Duff-Norton Co.

146 **Casters and Wheels**—Comprehensive selection data on a line of casters and wheels for a variety of applications is presented in 60-pp Catalog 60. Tables listing wheel specifications are included, as well as photos and diagrams illustrating design and construction features. Payson-Harris & Reed, Inc.

147 **Adjustable Ramps**—Contained in this 8-pp bulletin is detailed information on a line of powered adjustable ramps for loading docks. Factors to be considered when selecting a leveling device to meet varying operating requirements are covered. Rowe Methods Inc.

148 **Worm Gear Jacks**—Eight-pp Bulletin AD-66a features a sectioned illustration of company's worm gear jack and lists specifications and applications. Dimensional drawings are included, as well as an application analysis form. Duff-Norton Co.

149 **Boxcar Unloader**—Featured in 8-pp Book 2845 in the Kar-Flo, a boxcar unloader which shakes the boxcar on air springs to unload grain, chemicals, other bulk materials. Photos illustrating design details are included, as well as dimensions and specifications. Link-Belt Co.

150 **Plan-It-Yourself Rack**—Fundamentals of designing and constructing a storage rack to suit requirements are covered in this illustrated 24-pp booklet. Outlines method of constructing various racks, including pallet, drum, bar-stock or general purpose, from ordinary pipe and simple clamp. Tube-Strut Corp.

HEATING, COOLING

151 **Unit Heaters**—Design and operating features of direct fired unit heaters for oil, gas and dual fuel are shown on a large cutaway view in this product bulletin. Dimensional and engineering data tables are included. Jackson & Church, Div., York-Shipley, Inc.

152 **Heating Coil Data**—Two do-it-yourself work sheets relate to use of company's Thermo-Panel coil. Data Sheet No. 58 presents fitting arrangements for single embossed panel—a total of 40 variations. Data Sheet 59 gives fitting arrangements for double embossed panels—22 variations. Sheets contain drawings and dimensions for elbows, couplings, fittings. Inlet and outlet sizes are given, also fitting lengths. Dean Thermo-Panel Coil Div., Dean Products, Inc.

153 **Far-Infrared Heating**—Eight-pp Catalog G-62 illustrates heaters using the far-infrared wavelength, designed for the drying, curing and baking of plastic, textiles, paper and inks, ceramic products and for metal preheating work, glass and many other uses. Typical applications are illustrated and specification data included. Edwin L. Wiegand Co.

154 **Heat Exchangers**—Design and cost comparison data on heat exchangers using company's integral low-finned tubing is presented in this 20-pp catalog. Explains where the finned tube should be used, how fins affect design of heat exchangers and fouling factors, and includes conversion charts for alloys. Wolverine Tube, Div. Calumet & Hecla, Inc.

Among New Catalogs Of Special Interest

155 **Let Air Do It**—How "air may do the job" through use of air motors, compressors and vacuum pumps is told in 12-pp Booklet App-81. Written as an idea stimulator, it contains 43 photos and case histories of current original equipment applications. Diagrams illustrate pneumatic principles used to perform various functions. Gast Mfg. Corp.

156 **Paint Finishing**—Six articles on factors to consider when planning a paint finishing system are contained in this 24-pp reprint. They cover conveying systems, layout, equipment for metal preparation, ovens, methods of paint application, and auxiliary equipment. Many photos are included, also line drawings illustrating a typical layout and giving details of five stages of metal cleaning and preparation. J. O. Ross Engineering Div., Midland-Ross Corp.

157 **Industrial Gases**—Catalog ADC892, 32-pp, covers production and applications of currently available industrial gases, offering a comprehensive survey of how each gas is made, delivered and used. Emphasis is placed on extensive use of industrial gases in metalworking, chemistry, building and construction, aircraft, food processing, steel production etc. Gases included are oxygen, nitrogen, argon, helium, acetylene, hydrogen, carbon dioxide and rare gases. Physical properties of gases are tabulated. Air Reduction Sales Co., Air Reduction Co., Inc.

SAFETY

158 **Oxygen Therapy**—Equipment and techniques for use during industry's "most urgent emergency"—the interruption of a worker's breathing—are described in 12-pp Booklet NM-116. Illustrates complete line of resuscitation and inhalation therapy equipment. National Cylinder Gas Div., Chemetron Corp.

Postage-free Reader Service Cards make it easy to order bulletins. Cards are provided on the facing page.

159 **Emergency Shower**—Twenty-pp Catalog 59 illustrates and describes a multi-spray emergency shower with swinging gate actuator. Features and advantages are described, and photos and dimensional drawings included. Logan Emergency Showers, Inc.

CONSTRUCTION AND MAINTENANCE

161 **Steel Structurals**—Ideas that promote fast, economical building construction through use of lightweight steel structurals are highlighted in this 16-pp booklet. Application and erection techniques are shown for construction of a wide range of buildings. Specifications and dimension details for each of the lightweight structural sections given. Jones & Laughlin Steel Corp.

162 **Pole-Type Buildings**—Designed to help in planning and erecting low-cost industrial and commercial buildings, Plan K-101 describes essential steps, from selecting the site to framing in the doors and windows. Featured and illustrated are actual buildings constructed in accordance with plans. Wood Preserving Div., Koppers Co., Inc.

163 **Interlocking Framing**—Featured in this 20-pp bulletin is a structural framing system employing a rigid connection without bolts, rivets or field welding, designed to reduce erection time and cost. Use of this system in construction of large warehouses is treated in detail. Dimensional diagrams and photos of typical buildings. Macomber Inc.

164 **Curtain Wall Systems**—Aluminum or steel curtain wall systems and insulated panels are illustrated and described in 20-pp Bulletin C-59. Features and advantages are detailed, and specifications and section diagrams are included. The William Bayley Co.

165 **Versatile Curtain Wall**—Featured in this 12-pp booklet is the Thinlite curtain wall, a complete, integrated curtain-wall system incorporating all components. Advantages are pointed out and materials of construction described. Full color illustrations show possible variations and some typical installations. Also provided are data on component parts, erection details. Kimble Glass Co. Owens-Illinois.

166 **Rugged Concrete Floors**—How Masterplate (concrete with metal aggregate) floors greatly outlast many concrete floors is explained in 24-pp Bulletin MP-24. Discusses features sought in industrial floors subject to heavy use—wear, corrosion resistance, economy, non-dusting etc.

BULLETINS

(Begins on page 21)

Photos and diagrams cover method of installing Masterplate floors and some typical installations. The Master Builders Co.

167 Floating Floors—Bulletin 1001 contains 8-pp of illustrated information on floating floors for use in computer and data processing rooms. Typical installations are illustrated and specifications included. Floating Floors, Inc.

168 Modular Movable Partitions—This 24-pp catalog describes movable interior partitions built around a single modular framing system to which a variety of different types of paneling can be attached. Includes illustration of basic parts used in the system, specifications, section drawings and elevations for ceiling-high, cornice-high, glazed railing and standard-railing partitions. Penn Metal Co. Inc.

169 Roof Bond—Described in this illustrated Form 6417, is a maintenance-type roof bond featuring nominal scheduled maintenance. Advantages are detailed and materials and application data furnished. The Philip Carey Mfg. Co.

170 Concrete, Masonry Treatments—Detailed information on products for concrete and masonry construction and building maintenance is presented in Catalog GP559. Describes concrete surface treatments, concrete integral mixtures, and waterproofing and damproofing compounds. Tretol, Inc.

171 Matting Blueprint—A "blueprint" for floor matting applications for industry is presented in this illustrated bulletin. Contains description of all types of safety and comfort matting, and a floor plan of typical industrial plant showing proper mattings to use. American Mat Corp.

LUBRICATION

173 Chain Drive Lubrication—Principles of lubrication, maintenance, and oil selection for roller and silent chain drives are covered in this product bulletin. Oil selection charts are included. Sun Oil Co.

174 Colloidal Dispersion—Included in this company publication are illustrated articles about advantages of using 'dag' brand colloidal and semi-colloidal dispersions for lubricants. A variety of typical applications described. Acheson Colloids Co.

TOOLS, WELDING AND MACHINE SHOP EQUIPMENT

176 Precision Hand Tools—This illustrated 12-pp booklet describes a line of hand tools for industry, including knives, refill blades, mortise-lock pliers, needle files, pin vises, razor saws, chuck adapters, scraping tools. Handicraft Tools, Inc.

177 For Low Cost Tooling—This 66-pp catalog contains illustrated case histories that tell how company's tools are used in combination with other tools, with automatic controls and in special setups to combine operations, automate operation, increase production, improve quality and handle operations conventionally performed on special purpose machines. Separate sections cover single-spindle drill presses, multiple spindle drill presses, automated drill press setups, special setups, and dimensional data. Delta Power Tool Div., Rockwell Mfg. Co.

178 Welding Equipment—Oxyacetylene welding and cutting equipment is featured in 32-pp Bulletin GW2590. Includes complete product design and performance information on such items as gas pressure regulators, hose connections, low temperature cutting equipment, goggles, gas welding rods, face shields, trucks. Marquette Mfg. Co., Inc.

179 Carbon Dioxide Welding—Catalog 235OB contains 24-pp of information on company's gas-shielded metal-arc process for welding of mild steel and low alloy steels with carbon dioxide shielding gas. Covers fundamentals of process and describes characteristics, how both conventional and dip transfer welding are applied to specific jobs, and equipment used. Air Reduction Sales Co., Div. Air Reduction Co., Inc.

180 Machine Tools—Featured in 48-pp Catalog WT-50-9 is a line of light-heavyweight machine tools and accessories, including drill presses, grinders, cut-off machines, band saws and belt and disc surfaces. Complete specifications, catalog listings and descriptions of accessories are included, as well as illustrations. Walker-Turner Div., Rockwell Mfg. Co.

181 New Machines Needed?—This 14-pp illustrated fold-out brochure tells how replacement of old machines paid off for six manufacturers. Points out that there is a mathematically right time to replace a machine tool when the replacement works out to the user's best advantage production-wise and investment-wise. Replacement analyses illustrated show savings in production costs ranging up to $29,222. The Heald Machine Co.

182 Machine Cutting Torch—Twelve-pp Catalog 823 (ADC 880) covers company's line of machine cutting torches, tips and accessories, designed for use with oxygen and a fuel gas—acetylene, propane, natural or city gas. Selection tables included. Air Reduction Co., Inc.,

183 Data On Taps—Catalog 802 contains 28-pp of selection data, information on class fit, limit numbers, gage data, and tap-drill and thread-engagement data for all common materials. It also includes a comprehensive drill diameter chart, tolerance data, and a glossary of screw thread terms. Besly-Welles Corp.

184 Cutting Oils—Ten different types of cutting oils, which provide for every metal cutting need, are described in this informative pamphlet. Described are mineral-lard oils, sulfurized-mineral oils, sulfurized-mineral-lard oils, sulfochlorinated-lard oils and emulsifying oils. Gulf Oil Corp.

"Know How" Booklets on Modern Plant Equipment

185 Electronics for Automation—Not a text in itself, Catalog HB-5901 provides 64-pp of information on home study training courses covering electronic fundamentals and electronics for automation. Summarizes lesson material covered and educational objectives. Shows how course presents such subjects as applications of industrial electron tubes, motors and motor controls, power supplies and regulation, sensing and control devices, servomechanism components, recording and readout devices etc. Includes details on handling of assignments and test papers, awarding of certificates upon completion of course, cost of tuition, "pay-as-you-learn" plan available. RCA Institutes, Inc.

186 For Training Drivers—This 20-pp instructors' manual is offered as a guide for industrial truck operators' training program. Deals with theory of operation; good driving practices; details of truck construction; practical operation of the truck; demonstration and written examination for the driver trainee. Photos of manufacturer's own trucks illustrate construction details, cartoons show how accidents happen and how to prevent them. Automatic Transportation Co.

187 On Chain Drives, Conveyors—Bulletins 59126 and 59127 outline installation, operation and maintenance procedures for chain drives and chain conveyors and elevators. Both bulletins are handy pocket-size editions containing practical information on how to install, operate, maintain and extend life of chain drives and conveyors. Chain Belt Co.

188 Aluminum Welding—A comprehensive survey of the techniques of welding aluminum using company's gas-shielded metal-arc and tungsten-inert-gas processes is presented in 120-pp Form ADI 1258. Illustrated with photos, charts and diagrams, it covers such topics as weldability of aluminum and its alloys, definitions and technical discussions of the two welding processes, selection of proper process, manual and automatic equipment, welding power supplies, and safety. Air Reduction Sales Co., Div. Air Reduction Co., Inc.

Goodyear specifies Homestead Valves for non-contamination of GR-S latex rubber

Homestead lubricated plug valves handling latex rubber.

Through the round ports of Homestead Lubricated Plug Valves at Goodyear Tire and Rubber Company's synthetic rubber plant in Houston, Texas, flow dilute solutions of GR-S latex rubber at 80 p.s.i. and 100° F.

Fluid solutions never lodge and build up in the line since Homestead Round Port Valves provide full circular opening through plug and body of the valve—same size as the pipe they serve.

Controlled pressurized lubrication plus extremely close tolerances between plug and body assure lubrication of all sealing surfaces without contamination of line fluids.

Write for complete details on low first cost, low maintenance, Homestead Valves in our catalog 39-1.

207

☐ Please send me catalog and prices on Homestead Lubricated Plug Valves.

Name.....Title.....

Company.....

Address.....

City.....Zone.....State.....

hv

HOMESTEAD VALVE MANUFACTURING COMPANY
P. O. Box 207, Coraopolis, Pennsylvania

For more facts circle 631 on Reply Card

BULLETINS

(Begins on page 21)

INSTRUMENTS, CONTROLS

189 Indicating Flow Meters—This catalog combines all basic information on company's flow meters, flow switches, and manometers. Covers material composition of components, design charactertistics, mounting methods, scales, maximum application temperatures and pressures, direction of flow, pipe connection locations, and other data necessary for installation and operation of flow meters. Seico Instrument Div., Eclipse Fuel Engineering Co.

190 Dynamic-Measuring Instruments—Featured in 16-pp Bulletin 1310 is a line of dynamic-measuring and recording instruments, including oscillographs, data amplifiers and bridge balances; vibration measuring equipment; and power supplies. Recording oscillograph specifications and galvanometer specifications are included. Electro Mechanical Instrument Div., Consolidated Electrodynamics Corp.

191 Indicating Gages—Complete information about company's pointer and indicator gages is contained in a series of product specification sheets. Includes application, construction and operation data. The Hays Corp.

192 Photoelectric Control—Bulletin GEA-6822, 16-pp, describes controls for a variety of industrial counting, sorting, signaling, protecting, diverting, detecting, or limiting applications. Included are descriptions, specifications and pricing data on self-contained relay, transistorized relay, high-speed relay, explosion-proof relay, long-distance relay, smoke-density indicator. General Electric Co.

193 Packaged Control Systems—Described in 10-pp Bulletin 170 are packaged control systems for gas-engine-driven compressors. Typical installations are pictured and various models are described as to features and instrumentation. Clark Bros. Co.

OTHER EQUIPMENT

194 Fluorocarbon Resins—Electrical and electronic properties of fluorocarbon plastics are detailed in this 26-pp bulletin. Gives properties of the material, suggests design considerations in electrical and electronic systems, and reviews specific applications in which these resins solved a design problem. E. I. du Pont De Nemours & Co.

195 Dust Collector—Eight-pp Bulletin 291A describes characteristics and operation of a dry centrifugal dust collector designed to handle large exhaust volumes of granular dust. Cutaway diagrams and schematic drawings illustrate details and chart lists dimensions. American Air Filter Co., Inc.

196 Reinforced Plastics—Described in 28-pp Catalog P-11 is a wide range of applications for polyester-glass industrial corrosion-resistant equipment. Covers physical properties, chemical resistance and typical equipment applications, and includes specifications, selection data. Haveg Industries, Inc.

197 Industrial Aluminum—A thought-provoking glimpse of the industrial uses of aluminum foil is provided in 26-pp Form 20-11206. Featuring a colorful cover printed on foil, bulletin illustrates a variety of uses in architectural, electrical, heating, cooling, printing, textile, industrial packaging, other applications. Aluminum Co. of America.

198 Foamed Plastic Insulation—Featured in this product bulletin is a flexible foamed plastic insulation designed to stop condensation and save heat on air-conditioning, refrigeration and plumbing and heating lines. Tables of dimensional data included. Armstrong Cork Co.

199 Nuts and Fasteners—A line of clinch, pilot and weld nuts in standard and special types is fully described in this 16-pp illustrated catalog. Specifications and applications fully detailed, and tables of recommended nut torque and pertinent screw thread information given. The McLaughlin Co.

200 Marking Devices—Automatic roll marker and manual marking devices for most product marking and identifying requirements are pictured in 24-pp Catalog MA-59. Models for automatic OD and radial end-face markings are shown along with manual flat and round face markers, hammers, holders. New Method Steel Stamps, Inc.

201 Precision Finishing—This 30-pp catalog on precision mechanical finishing and automatic finishing processes outlines various types of finishing and abrading processes such as grinding, deburring, descaling, and polishing. It also explains how radii can be broken and fatigue resistance of metal parts strengthened through mass production finishing techniques. Dimensions, capacities and recommended usages are also covered. Roto-Finish Co.

202 Sheet, Plate Fabrication—A variety of parts and assemblies available—from massive boiler breechings to smallest stamping—are illustrated in 40-pp Bulletin F4. Facilities and equipment for production are illustrated, including shearing, contour cutting, punch press, large presses, brakes, welding, large and small structural, assembly. The Kirk & Blum Mfg. Co.

203 Metal Processing Service—A complete metal processing service, ranging from the design, installation and service of a variety of metal preparation and finishing machines to the compounds and chemicals themselves, is described in this 10-pp bulletin. Pennsalt Chemicals Corp.

DATA FILE of literature for the plant engineer's library

STANDARD CATALOGS, bulletins and handbooks are listed to help plant engineers maintain a permanent data file. To get these free catalogs, circle item numbers of those wanted on postage-free cards provided on pages 209 and 210.

LIGHTING, COMMUNICATION

301 Architectural Floodlighting—Eight-pp Bulletin GEA-6437 illustrates various methods of floodlighting industrial plants, public and commercial buildings and others. Provides information on general purpose models. General Electric Co.

302 Lamp Data—Incandescent and fluorescent lamps are featured in this 16-pp bulletin. Selection tables list complete descriptive and electrical details. Champion Lamp Works.

303 Lighting Units—Design and performance advantages of Wide-Lite units for use with color-corrected mercury vapor lamps are detailed in this product bulletin. Typical candlepower distribution curves are included. Wide-Lite Corp.

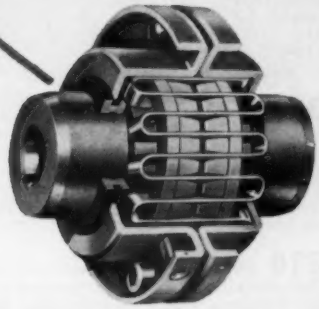
304 For Hazardous Locations—Explosion-proof and dust-ignition-proof mercury vapor lighting fixtures are described in Bulletin 2705. Lists explosion-proof fixtures with five styles of reflectors, all available with or without guard, two styles of dust-ignition-proof units. Crouse-Hinds Co.

305 Communication System—Featured in this bulletin is a transistorized communication system designed to provide communication between two or more persons or departments regardless of distance or surrounding noise conditions. Operating and equipment features are detailed. Gai-Tronics Corp.

INSTRUMENTS, CONTROLS

306 Precision Instruments—Catalog G1 contains 32 pp of comprehensive information on indicating, recording and controlling instruments. Contains descriptive and illustrative data on potentiometers, pyrometer supplies, systems and components, null indicators, amplifiers and oscillographs, pressure gages, flow and liquid level

Photo shows portable pump unit connected to internal combustion engine by a Type F FALK Steelflex Coupling



How FALK STEELFLEX Couplings give your connected machinery Double Protection

FIRST: *They protect against shaft misalignment.* Some degree of shaft misalignment is unavoidable—and unless protective compensation is provided, additional loads are developed on shafts, bearings and other revolving elements. The result is excessive wear-and-tear—and often actual breakage....FALK Steelflex Couplings compensate for either angular or parallel misalignment—*or for the more serious condition involving both!* The exclusive Steelflex gridmember which joins the two hubs is not fastened to either hub; thus, either hub can shift in any direction without imposing a load on the other hub.

Yet, important as protection against shaft misalignment is to you, it is only one function of the *truly flexible* FALK Steelflex Coupling.

SECOND: *They protect against torque fluctuations* which create excess wear on connected machines and frequently induce destructive shaft misalignment. The exclusive FALK Steelflex grid-groove design cushions shock loads, dampens vibration, reduces impact loads as much as 30 per cent. You get this extra margin of protection that *can mean the difference between operating and breakdown!* You save on maintenance costs. And —you prolong the service life of your machines!...For complete information, ask your FALK Representative or Authorized Distributor. Or—**write direct for Bulletin 4100.**

FALK and STEELFLEX are Registered Trademarks

THE FALK CORPORATION, MILWAUKEE 1, WISCONSIN

Representatives and Distributors in Most Principal Cities

Manufacturers of Quality Gear Drives and Flexible Shaft Couplings

For more facts circle 632 on Reply Card

Basic Type F FALK STEELFLEX COUPLING fills the needs of 90% of industrial applications

This cutaway view shows the exclusive Steelflex design which provides *torsional resilience with the strength of steel.* This torsional resilience spreads peak or shock loads over a relatively long increment of time, thus *greatly reducing stresses* in connected machinery.

The versatile Type F Steelflex can be used horizontally or vertically, without modification or special parts. It is ideally suited to 9 out of 10 applications. For unusual applications involving overload conditions, extended shafts, brakes, etc., standard designs of dual-purpose Steelflex couplings are available.

For most applications, you can give your machines the extra protection afforded by FALK Steelflex Couplings at no extra cost!

FALK

...a good name in industry

DATA FILE

(Begins on page 214)

meters, pneumatic remote transmission, thermometers, panelboards, valves, diaphragm motors, motor and dampers, switches, etc. Minneapolis-Honeywell Regulator Co.

307 Meters Regulators, Valves — Bulletin C-5000, 28 pp, describes and illustrates meters, regulators and valves for a wide range of services. They include gas meters, gas pressure regulators, industrial meters, water meters. Information includes application suggestions, specifications and references to more detailed product literature. Valve section provides operational data, shows major valve patterns in Rockwell-Nordstrom line, explains design. Rockwell Mfg. Co.

308 Gages, Needle Valves—Catalog 76-G consists of a loose-leaf bound collection of literature on gages and needle valves. Various types of gages are illustrated and described, with applications and specifications fully detailed. Jas. P. Marsh Corp.

309 Turbine-Type Flowmeter—Described in this 8-pp bulletin is a turbine-type flowmeter for bulk plants, pipelines, refineries, chemical, food processing and other industrial services. The Potter-Bowser Meter Div., Bowser, Inc.

310 Dial Thermometers — Catalog 205 contains 12 pp of illustrated data on features and characteristics of a line of dial thermometers for industrial applications. Complete dimensional and specification data is included. United States Gauge, Div. American Machine and Metals, Inc.

311 Temperature Controls—Eight-pp Catalog CC, on temperature controls and allied equipment for heating and refrigeration, provides information on recording, indicating non-indicating controls; thermometers; bulb accessories. The Partlow Corp.

313 Graphic Instruments—Featured in 16-pp Catalog 657 is a line of graphic instruments designed to serve a variety of industrial measuring applications. Complete descriptive details on various types of recorders and accessories included, as well as ratings. The Esterline-Angus Co., Inc.

314 Stroboscope Data — Applications of the electronic stroboscope are illustrated and described in 8-pp Form 766-D. Includes complete descriptive and specification data on the Strobotac—a small, portable stroboscope tachometer—as well as on the Strobolux, the Strobolume and the Microflash. General Radio Co.

315 Electronic Counters—Featured in this product bulletin is a line of high speed electronic counters. Various types of counters are illustrated and described and engineering details furnished. Veeder-Root Inc.

VALVES, TRAPS, PIPING

316 Lubricated Plug Valves—Reference Book 39, Section 1, contains 28 pp of detailed information on features and advantages of company's lubricated plug valves designed for low-cost fluid control. Tables of dimensional data are included. Homestead Valve Mfg. Co.

317 Stainless Steel Valves—Corrosion resistant stainless steel valves are featured in 32-pp Catalog 59SS. Features of design and construction are shown through cutaway views, and advantages of stainless steel in withstanding corrosive attack of chemicals and atmospheres are detailed. Jenkins Bros.

319 Steel Check Valves—Bulletin 110 describes features and advantages of steel check valves for vertical or horizontal installation. Specifications and dimensional tables are included. Combination Pump Valve Co.

320 Pressure-Reducing Valve—Bulletin J-160 describes features and advantages of company's pressure reducing valves for dead end shut-off and positive pressure regulation. Operation details are shown on cutaway view, and recommended capacities given on tables. OPW-Jordan.

321 Impulse Steam Traps—Bulletin T1744 describes a line of impulse steam traps designed for light condensate load requirements. Operation is detailed, and capacities, dimensions tabulated. Yarnall-Waring Co.

322 On Steam Traps—Catalog K is an enlarged 48-pp manual and steam trap catalog. New material provided includes open float and thermostatic traps, pipe strainer to 6 in. in steel and semi-steel, and helpful steam pipe sizing tables. Discusses fundamentals of good trapping, trap selection, installation, testing, repairs. Armstrong Machine Works.

323 Process Piping—Chemical-resistant plastic pipe, fittings and valves are featured in 16-pp Bulletin CE-80. Advantages are detailed, and installation procedures outlined. Technical data tables are also included. American Hard Rubber Co.

324 Plastics in Piping—Handbook C-159, 16-pp, describes technology of plastic piping systems, installation and coupling methods, standards for plastic pipe. Provides temperature and working pressure chart for valves, and a table of service recommendations showing effects of 280 chemicals on five plastics used in manufacturer's valves. Gives data on valves, fittings. Chemtrol.

325 Teflon Hose Assembly—Advantages of company's Springfield 120 Teflon hose assembly are detailed in this illustrated bulletin. Assembly procedure is pictured and described and design specifications are tabulated. Titeflex, Inc.

326 Lined Clay Pipe—Described in this illustrated brochure is a glass lined sewer pipe with built-in advantages. Performance and installation details are illustrated. American Vitrified Products Co.

327 Guide to Couplings—This 26-pp general catalog describes company's quick-connect, quick-disconnect couplings, including a coupling for high pressure applications, for impact in air lines, for low pressure applications, for vacuum and very low pressures, etc. Snap-Tite, Inc.

329 Self-Cleaning Strainer—Bulletin 1210B describes self-cleaning, semi-steel pipeline strainers in sizes from ¼ through 3 in., featuring high strength construction of the bodies, long tapered screen socket, perforated heavy-gage screen. Includes dimensions, weights. Sarco Co., Inc.

FILTERS, FILTERING

330 Filters, Strainers — Industrial Catalog 1058, 48 pp, provides application and engineering information on company's line of micro-filters and precision strainers. Fuel filters, full flow and by-pass lube filters, dry type air filter, air separators, and metal edge strainers shown. Purolator Products, Inc.

331 Activated Carbon — Absorbency characteristics of activated carbon and its application in filtration, purification, refining and reclamation processes are discussed in this 10-pp bulletin. Typical uses of granular and pulverized activated carbon are illustrated. Activated Carbon Div., Pittsburgh Coke & Chemical Co.

332 Filters for Industry—Illustrated and described in this product bulletin are filters for a variety of applications in industry. Among those covered are liquid filters, intake filters, pipe line filters, dry and viscous panel filters, precipitators, Electro-Staynew mist collector, and a dual action filter. The Dollinger Corp.

DUST, FUME CONTROL

333 Power Exhausters — Bulletin 58-B contains 12 pp of detailed information on company's line of power exhausters. Construction features are illustrated and described, and performance and dimensional tables are included. Cutaway views and drawings show internal construction features. Jenn-Air Products Co., Inc.

334 Dust and Mist Collectors—Illustrated and described in this fold-out, chart-size bulletin is company's line of dust and mist collectors and accessory equipment. Detailed specifications are included, as well as photos of typical applications. Aget Mfg. Co.

335 Dust Control Systems—Bulletin 104, 36 pp, on company's dust filters, gives detailed information about dust control systems and how to engineer them. Includes description of the Roll-Clean Dynaclone dust filter, as well as information, capacities and dimensions for other dust filters. The W. W. Sly Mfg. Co.

PAYMENTS OUT OF SAVINGS

Let General Electric Capacitors Pay for Themselves

Now you can realize the benefits of capacitors without tying up working capital or your credit line. General Electric's new Time Purchase Plan allows you to take full advantage of the power-bill savings that G-E capacitors make possible. You can use the money that capacitors save in reduced power costs, released system capacity, improved voltage levels, and reduced power losses to make the monthly payments provided for by the plan. You pay as you save.

Check these General Electric Time Purchase Plan benefits . . .

- You can purchase capacitors on a monthly basis . . . it's easy and convenient.
- Your working capital and credit line remain intact.
- You can purchase additional General Electric capacitor units and equipments by simply amending the original contract.

Find out how your capacitors can pay for themselves. Let your General Electric sales representative recommend a Time Purchase program suited to your needs. He'll be glad to help you. Contact your nearest Apparatus Sales Office, or write Section 446-8, Schenectady 5, N. Y.

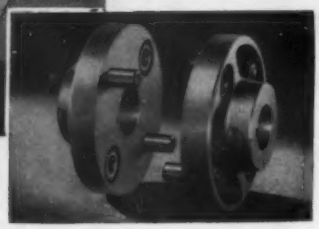
Progress Is Our Most Important Product

GENERAL ELECTRIC

For more facts circle 633 on Reply Card

Left: Periphery and face of Series 400 flanges are machined to simplify lining up with straight edge or feeler gauge.

Below: Separated halves show arrangement of 4 drive studs and rubber cushioned sleeve bearings.



AJAX

NEW *Series 400*

Normal Duty Flexible Couplings

at New Low Cost

● Original equipment manufacturers and plant engineers can now have the protection of AJAX positive resilient drive for direct-connected machines at minimum cost.

New AJAX Series 400 rubber cushioned flexible couplings are particularly suited to connect motors directly to pumps, fans, mixers, speed reducers, light duty hoists, compressors, and other machines with average torques in relation to shaft diameters.

The performance of new AJAX Series 400 Couplings is based on the same proven design which has been giving satisfaction in hundreds of thousands of installations for 40 years.

Their 4 steel studs and sleeve bearings require no lubrication. Rubber cushions absorb unavoidable misalignment, and their resiliency provides a quiet cushioned drive in both directions of rotation.

AJAX Series 400 Flexible Couplings are made in 4 sizes with 1¼", 1¾", 2¼", and 2¾" maximum bore respectively with standard square keys.

Mail coupon for Catalog 67.

AJAX

AJAX FLEXIBLE COUPLING CO. INC.
100 Portage Road, Westfield, N. Y.

Send Catalog 67 on Series 400 Couplings.

Name_____

Concern_____

Address_____

For more facts circle 634 on Reply Card

DATA FILE

(Begins on page 214)

336 Air Pollution Control—Featured in this 8-pp bulletin are solutions to air pollution control and heat recovery through catalytic oxidation. Typical problems and solutions in organic finishing and drying, chemical industry, oil refinirey industry, and food processing industry are detailed, and package catalyst units for all types of applications are described. Oxy-Catalyst, Inc.

FANS, VENTILATING, AND AIR CONDITIONING

337 Induced Draft Fans—Catalog L-3 describes induced draft fans designed for any induced draft apolication for temperatures up to 800 F. Gives dimensions, capacities, as well as installation data. Fuller Co.

338 Mechanical Draft Fans—Eight-pp Catalog 1361 describes centrifugal fans designed for handling abrasive gases at elevated temperatures. Complete application, performance and physical data are given, as well as a list of optional accessories. Sturtevant Div., Westinghouse Electric Corp.

339 Ready Units—Catalog 515 provides 28-pp on complete, ready-to-run centrifugal fan equipment. Capacities 400 to 13,000 cfm, v-belt and direct driven units. Dimensions and capacities included. Clarage Fan Co.

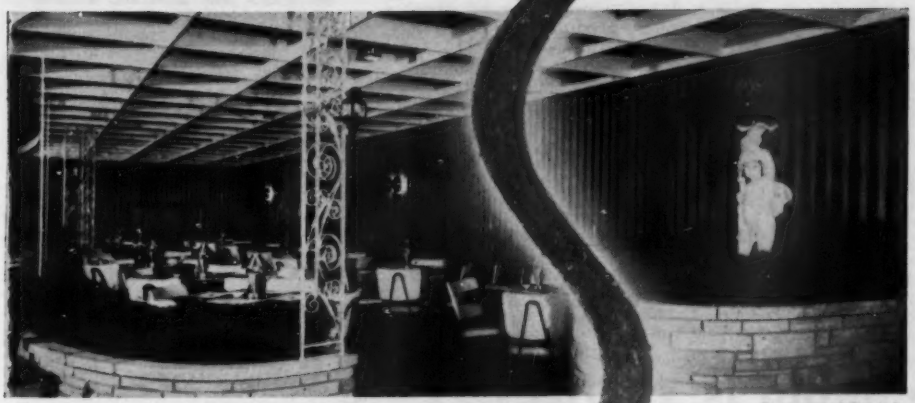
340 Power Roof Ventilators—Bulletin 2302 is an 8-pp selection guide to company's low silhouette line of power roof ventilators. Dimensions, capacity tables, and details on accessories and protective coatings are included. Ilg Electric Ventilating Co.

341 Industrial Diffusers—Described in 8-pp Catalog F-7722 is a line of industrial diffusers designed for applications where full range air pattern adjustment is essential to human comfort. Complete dimensional data, diagrams and specifications are included. Barber-Colman Co.

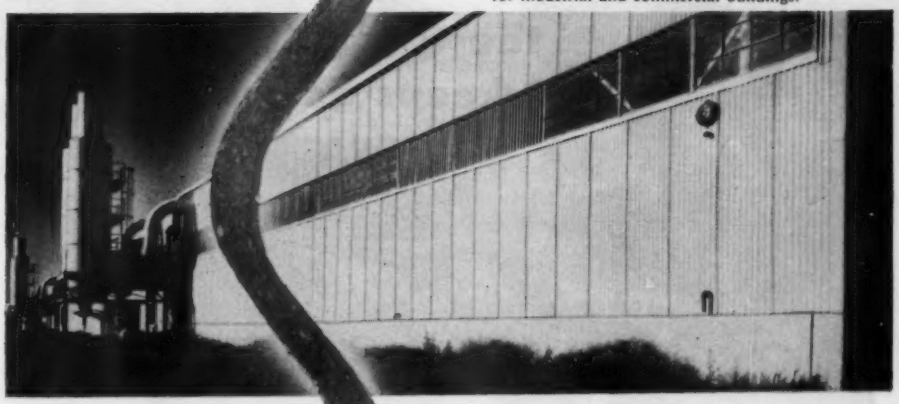
342 Industrial Fans—Bulletin 690-A, 12 pp, contains dimensions and application and performance data on direct connected fans for general and system ventilation and power roof ventilators, with air deliveries to 103,200 cfm. Design features and typical installations illustrated. Propellair Div., Robbins & Myers, Inc.

343 Standard Duty Fans—Designs and construction details of company's line of standard duty fans are covered in 28-pp Bulletin 572. Points out advantages, shows arrangement and application, describes accessories. The New York Blower Co.

344 Air-Moving Equipment—Bulletin DB 45-58, 20 pp, contains detailed information on company's line of roof ventilators, bifurcators, axial flow vent sets, and air jets. Bonded



Corrugated Transite sheets add eye appeal to lounges and terraces.



Corrugated Transite sheets provide rugged service for industrial and commercial buildings.

CORRUGATED *asbestos* TRANSITE®

...for eye appeal—

...for rugged service

Johns-Manville Corrugated Transite sheets wear like stone. They are made of two virtually indestructible materials—asbestos and cement. Corrugated Transite can't burn, can't rot, can't rust—requires practically no maintenance.

Use it inside or outside—paint it a color or take advantage of its innate stone-gray attractiveness—use it with other materials for contrast or variation—use it alone to emphasize the light and shadow of the corrugations.

Sheets of Corrugated Transite are 42″ wide (10 corrugations) in lengths up to 12′—cover big areas quickly with minimum framing. For full information on this versatile material, send for the free 32-page brochure, "Corrugated Asbestos Transite." Write to Johns-Manville, Box 158, New York 16, N. Y. In Canada, Port Credit, Ont.

JOHNS-MANVILLE

JOHNS-MANVILLE JM PRODUCTS

For more facts circle 635 on Reply Card

DATA FILE

(Begins on page 214)

performance ratings are listed on tables, and dimensional data included. DeBothezat Fans Div., American Machine and Metals, Inc.

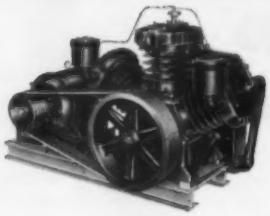
346 Air Engineering—Bulletin E-57 is a 24-pp air engineering data file covering engineering and test facilities for propeller fans, specifications, construction, maintenance, and installation. Tables for estimating air-handling requirements, entrance and elbow losses are provided. Aerovent Fan Co., Inc.

347 For Air Handling—Sixteen-pp Bulletin 518 illustrates and describes manufacturer's products for air filtering, cooling, heating, cleaning (controlling process dust), moving, exhausting, humidifying and dehumidifying air. These include Kennard, Herman Nelson, Illinois Engineering and American Air Division product lines. Fully illustrated, booklet provides brief application tips. American Air Filter Co. Inc.

348 Air Conditioning Systems—Summer and winter air conditioning systems for year-round comfort are illustrated and described in 24-pp Form L-115. Covers waterless condensing units, cooling coils, fan-coil units, water-cooled packaged air conditioners, gas and oil winter air conditioners, and individual room conditioners and other equipment. Capacity data, dimensions, and specifications. Airtemp Div., Chrysler Corp.

349 For Air Purification—Twelve-pp Bulletin 108 A describes and illustrates Dorex activated carbon air purification equipment—C cells and H cannisters. Data on equipment selection, installation and application is given, also information on Dorex replacement service. Discussions of activated carbon and how to achieve conditions generally necessary for proper purification are included. Connor Engineering Corp.

Where the going is TOUGHEST the Curtis keeps going!



Sandiest FOUNDRY conditions haven't stopped this CURTIS AIR COMPRESSOR

- CURTIS-SEAL CRANKCASE
- TIMKEN MAIN BEARINGS
- SELF CENTRO-RING OILING
- AIR COOLED: NO COOL WATER REQUIRED
- PRECISION BUILT

The CURTIS C-100 two-stage air-cooled air compressor. 25-30-40 H.P.

For compressed air—industry depends on *Curtis*. Eliminate production line delays. Get more air faster . . . at lower cost. Where the going is toughest (foundry, factory or shipyard) put the CURTIS C-100 to work and forget it!—Full line of industrial compressors for ordinary and special applications.

For complete information write for illustrated folder.

OUR 105th YEAR

Curtis

MANUFACTURING COMPANY · PNEUMATIC DIVISION

Write Dept. 46, St. Louis 20, Missouri C-62

For more facts circle 636 on Reply Card

MAINTENANCE

351 Basic-Roofing Information—"What You Should Know About Your Roof" is a 40-pp clearly illustrated booklet which tells what makes a roof fail, how to recognize signs of roof deterioriation, what to do to keep a roof in good condition. Discusses roofing practices. Johns-Manville.

352 Zinc Coating—This bulletin describes a special zinc coating applied as a paint to provide galvanic protection to metals. A variety of applications are detailed. Subox, Inc.

353 Steel Surface Protection—Described in this bulletin are properties and advantages of Dimetcote 3, an inorganic zinc coating which "cold galvanizes" any steel surface. Typical applications are illustrated and general properties listed. Amercoat Corp.

355 Color Conditioning—How to put the power of color to work profitably is explained in this 28-pp color conditioning booklet. Tells how color conditioning boosts production, improves morale and promotes safety, and includes some full-color photos to illustrate "before-and-after" situations in typical plants. E. I. du Pont de Nemours & Co., Inc.

357 Air, Hydraulic Equipment Upkeep—"The ABC's on Maintenance of Air and Hydraulic Equipment," is a 24-pp cartoon-type booklet presenting the "rights" and "wrongs" in setting up and servicing air and hydraulic equipment. Major reasons for unsatisfactory performance and steps to prevent them outlined. Logansport Machine Co., Inc.

358 Industrial Steam Cleaners—Advantages of cleaning with steam are illustrated and described in this 6-pp bulletin. Applications for heavy-duty production cleaning, paint-stripping, phosphatizing are detailed and complete specifications on the portable units given. Turbo Machine Co.

359 Vacuum Units—This bulletin describes heavy-duty, portable vacuum units designed for a variety of plant housekeeping jobs. Application in removing litter, conveying or reclaiming materials, and collecting hazardous matter is covered. Invincible Vacuum Cleaner Mfg. Co.

For that extra margin of Safety . . .

Specify Blaw-Knox Electroforged® Steel Grating and Treads

Men working around cars on a trestle must have sure footing in any weather. Blaw-Knox Electroforged Steel Grating with its non-slip twisted crossbar provides a walking surface that is safe and clean. Snow does not pile up and freeze, and rain cannot form puddles. Spillover from cars falls through, making frequent cleaning unnecessary.

Electroforging also insures structural strength. Bearing bars are not weakened by slotting in fabrication. Rigid one-piece construction has no bolts or rivets to work loose under strain.

One-piece construction cuts easily to fit neatly around pipes and beams. No alteration of existing structures is required.

For information on how to specify the Blaw-Knox Electroforged Steel Grating best suited to your needs, write for your copy of Bulletin 2527-R.

BLAW-KNOX COMPANY

BLAW-KNOX

Blaw-Knox Equipment Division
Dept. H, Pittsburgh 38, Pa.

For more facts circle 637 on Reply Card

DATA FILE

(Begins on page 214)

360 **Industrial Vacuum Cleaning**—Twelve-pp Bulletin 155 B describes both stationary vacuum cleaning equipment and portable industrial vacuum cleaners, the latter in both light and heavy-duty types. Recent improvements in collection are covered. Spencer Turbine Co.

361 **Wooden, Aluminum Ladders**—Bulletin L-94 describes company's Gold Medal and safety aluminum ladders. Contains illustrations, construction details and specifications of over 20 types of ladders including those for electricians, mechanics ,ect. The Patent Scaffolding Co., Inc.

362 **Engineered Maintenance**—This 16-pp booklet tells how to control costs, improve efficiency and save management time in sanitary maintenance. Tells what an engineered maintenance program includes, how it is prepared and presented, and what are its advantages. Puritan Chemical Co.

BOILERS AND GENERATORS

363 **Hot Water Boilers** — Catalog HCC-2, 20 pp, describes and illustrates design, construction, advantages and economics of company's controlled circulation hot water boiler for supplying high pressure, high temperature water for heating systems and process applications. Combustion Engineering, Inc.

364 **Self-Contained Boilers**—Bulletin AD-162, 8 pp, describes company's complete line of self-contained boilers for heating and processing steam or hot water. Design features and advantages are also covered. Cleaver-Brooks Co.

365 **Boiler Construction** — Bulletin BE100 describes advantages of practical boiler construction with 2 pass design, featuring comparable results with equal heating surface, but with Continental's two-pass features—turbulent spinning gas technique-uniform heating, no refractory baffles and symmetry of furnace layout. Boiler Engineering & Supply Co.

366 **Steam Generator**—Bulletin 582 CS describes design and operation features of company's vapor water tube steam generator which differs from conventional water tube steam generators in that initial heating and final vaporization occur in the shell. TXT Texsteam Corp.

368 **Package Steam Generator** — This illustrated folder describes in detail features and advantages of company's line of package steam generators. Specifications are included. Cyclotherm Div., National-U.S. Radiator Corp.

369 **Steam Generators**—Design and construction details on a packaged unit steam generator are presented in 10-pp Bulletin PSG-3. Fabrication procedures are illustrated and capacities, dimensions and weights tabulated. Henry Vogt Machine Co.

PUMPS, COMPRESSORS

371 **Single Suction Pumps** — Ball bearing single suction pumps are illustrated and described in 24-pp Bulletin 976-H. General data and specifications are included, as well as rating tables, outline dimensions, sectional reference drawings. Buffalo Pumps, Div. Buffalo Forge Co.

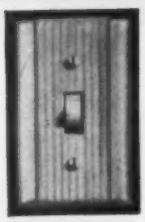
372 **Centrifugal Pumps** — Advantages of cradle-mounted centrifugal pumps are detailed in 20-pp Form 7223-B. A cutaway view illustrates performance features and tables list dimensions and specifications. Cameron Pump Div., Ingersoll-Rand Co.

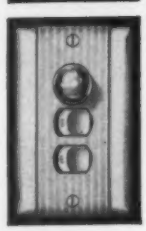
374 **Sludge Handling Pump**—Bulletin P10-B32 covers use of company's Torque-Flow pump for a sludge transfer application. Such advantages as greater output and less maintenance are detailed. Western Machinery Co.

376 **Oil-Free Compressors**—Heavy-duty industrial oil-free compressors are featured in 12-pp Bulletin A-44. Component parts are illustrated and described, and internal construction is shown on cutaway. Joy Mfg. Co.

Built to take it... Indefinitely!

THE NEW P&S ROCKER-GLO SWITCH





Here is a switch that can take it . . . and come back for more. Install Rocker-Glo in the most used and abused stations in institutional, commercial or factory building. Then watch its continuous, perfect, satin-smooth performance.

P&S Rocker-Glo switches are AC switches, designed to be used at full current ratings on tungsten filament and fluorescent loads – one does the work of two AC-DC switches for controlling fluorescent fixtures. Rocker-Glo can be used anywhere old-style toggle switches are used.

Rocker-Glo is sturdily constructed. Its rugged, wall-hugging luminous rocker is not subject to breakage from accidental blows as is the case with ordinary switch handles. It's built to withstand punishment ordinary toggle or specialty switches cannot take – changes no wiring habits. Single Pole and Double Pole switches are indicating – you can tell when they're on or off.

Available in Despard interchangeable type, Despard Type mounted on strap and narrow rocker for tumbler switch plates. A specification grade switch, 15 and 20 amps. 120/277 volts AC.

For more information write Dept. PE-859

P&S

PASS & SEYMOUR, INC.
SYRACUSE 9, NEW YORK
60 E. 42nd St., New York 17, N. Y. 1440 N. Pulaski Rd., Chicago 51, Ill.
In Canada, Renfrew Electric Limited, Renfrew, Ontario

MAKE THE COMPLETE JOB COMPLETELY P&S

For more facts circle 638 on Reply Card

Some Straight Talk On Steam Trap Capacity

...or pulling away the curtain of confusion that surrounds steam trap capacity ratings.

Unfortunately, for the steam trap buyer, the subject of steam trap capacity has become cloudy and confused by a landslide of claims, counter-claims and inconsistent "standards" for measurement. So let's take a cold hard look at this subject so vital to the efficient operation of your plant.

What Determines Steam Trap Capacity?

There are three factors that determine the capacity of a steam trap:

1. The area of the orifice.
2. The density of the condensate.
3. The pressure differential across the trap.

Let's take a closer look at each of these:

Area of orifice is usually specified by the trap manufacturer or can be calculated from the diameter. Nothing complicated here.

Density of condensate depends on temperature. A cubic foot of cold water weighs 62.4 lbs. At 250° F. or 15 psi, it weighs less than 59 lbs. This is important. Don't overlook it.

Pressure differential across the trap is most significant. And it is complicated by the many factors that affect it, such as:

1. Pressure drop between unit drained and the trap when the trap valve is open.

2. Distance the trap valve is moved from the valve seat.

3. Back pressure on the trap with orifice closed; i.e., return header pressure.

4. Increase in back pressure produced by condensate and flash steam flowing in the discharge line. This in turn is affected by the diameter and length of the discharge line, plus friction caused by valves and fittings.

Orifice Capacity Vs. Steam Trap Capacity

Figure 1 shows a ½" diameter sharp-edged orifice at the end of a pipe filled with cold water at 15 lbs. pressure. The capacity of this orifice, using a .61 coefficient of flow would be 8,800 lbs. per hr. Now, would this ½" orifice if used in a ¾" steam trap installed as shown in Figure 2 provide the trap with a continuous discharge capacity of 8,800 lbs. of hot condensate per hour? The answer is "no". And here are some of the reasons why:

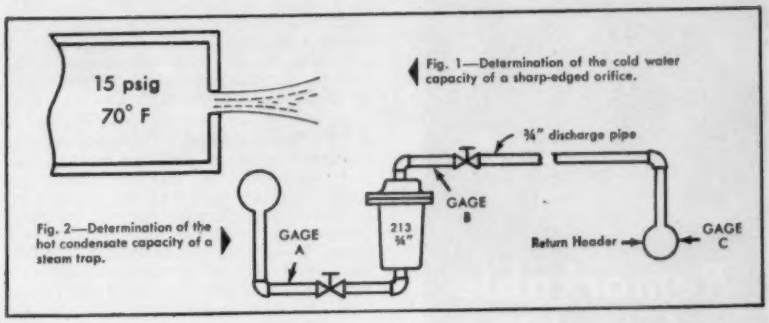


Fig. 1—Determination of the cold water capacity of a sharp-edged orifice.

Fig. 2—Determination of the hot condensate capacity of a steam trap.

Density of condensate. As pointed out above, cold water weighs 62.4 lbs. per cu. ft. At 15 lbs. pressure and 250° F. water weighs less than 59 lbs. per cu. ft. This difference in density alone reduces the lbs. per hour capacity of the orifice by over 5%.

Pressure differential across the trap. With the trap valve closed we have a static pressure differential of 15 psi. The trap valve must be able to open against this pressure. However, this is not the pressure differential that will determine the capacity of the trap valve.

The ¾" discharge line will be full of a mixture of flash steam and condensate. To keep this mixture flowing from the trap outlet to the return line requires a pressure differential. In actual capacity tests run as shown in Figure 2 Gage B at the trap outlet registered 11 lbs. back pressure. Thus the true pressure differential across the trap was about 4 lbs. Under these conditions the measured capacity of the trap was 4,340 lbs/hr. or just about half of the capacity of the ½" orifice for cold water.

How Armstrong Determines Capacity Ratings

Armstrong trap capacity ratings are based on hundreds of tests under actual operating conditions. In these tests, the condensate used was at the steam temperature corresponding to the test pressure. Thus, the capacities determined take into account the pressure drop that occurs when the trap orifice opens and the choking effect and back pressure of the flash steam. Actual installation hook-ups were used so that pipe friction in both inlet and discharge lines as well was reflected in the results.

Let's go back to the example cited above and in Figure 2. The trap referred to is an Armstrong No. 213. While it did test out at 4,340 lbs. per hour for a static pressure differential of 15 psi, it is rated in the catalog at only 3900 lbs. per hour for this pressure—just to be on the safe side.

For the trap buyer, this means that Armstrong Steam Trap capacities are based on handling condensate at steam temperature for the stated static steam pressure differential under actual working conditions.

Capacity ratings which don't take into account all of the variables will be misleading and may lead to the selection of undersized traps. So whenever you specify or buy traps be sure that the capacity ratings you work from are realistic. One way to be sure is to select Armstrong Traps with *guaranteed* capacity ratings.

* * *

Additional information on trap capacity ratings, plus data on how to correctly size, install and maintain steam traps for any pressure, any temperature and any load, are presented in the 48-page Armstrong Steam Trap Book. Ask your local Armstrong Representative for a copy or write:

Armstrong Machine Works
9128 Maple Street
Three Rivers, Michigan

ARMSTRONG STEAM TRAPS

For more facts circle 639 on Reply Card

LENNOX

"OG" SERIES
INDUSTRIAL HEATER

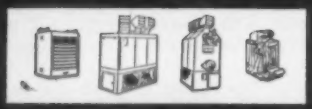
Remarkable Adaptability

Efficient heat transfer design results in reduced physical size of this heater . . . allowing it to take up a minimum of space. If floor space is at a premium, the "OG" can be suspended horizontally or inverted. Removable nozzles permit free standing or ducted installations.

DUAL FUEL
Power Burners

Burner operates equally well with either gas or oil. Changeover is instant and automatic.

LENNOX "Task-Matched" Equipment to control and condition air for industry



64,000 to 2,000,000 Btuh

CLIP AND MAIL FOR FREE SPEC SHEETS

LENNOX Industries Inc.
INDUSTRIAL DIVISION
P.O. Box 1294, Dept. PE 8
Des Moines 5, Ia.

Please send me—without obligation—complete specifications and engineering data on Lennox "OG" Series Industrial Heaters

Name.....
Company.....
Address.....City.....
Title.....

For more facts circle 640 on Reply Card

DATA FILE

(Begins on page 214)

377 Alloy Metal Pumps — Design and performance characteristics of company's heavy duty alloy metal pumps are detailed in Bulletin 5007. Specifications, dimensional data, performance curve, and dimensional diagrams showing component features are included. Dorr-Oliver Inc.

378 Air Compressors—Featured in this product Bulletin CAS-18 are air compressors designed for a variety of industrial applications, including tank or base mounted units, simple compressors, single and two-stage, air cooled, electric or gasoline driven, ¼ to 50 hp. Curtis Mfg. Co.

379 Water-Cooled Compressors — Featured in 12-pp Bulletin WB10 are two-stage water-cooled air compressors designed to meet the demand for small machines having efficiencies comparable to those of large two-stage horizontal compressors. Cutaway views showing component features are included, as well as general data tables. Gardner-Denver Co.

LUBRICANTS, LUBRICATION

380 Lubrication Systems—Bulletin 1450 illustrates and describes a line of lubrication and coolant systems engineered to provide maximum protection to bearing surfaces. A typical mill lubrication system is shown. Dravo Corp.

381 Organized Lubrication — Benefits of organized lubrication are extolled in this 24-pp bulletin. Cost control opportunities are detailed and the task of assigning responsibilities and delegating authority in an organized lubrication system discussed. Method of determining savings and setting up records to measure results covered. The Texas Co.

382 Product Guide — This handy little booklet gives information on manufacturer's line of industrial products—general lubricants, greases, diesel lubricating oils, metalworking oils, hydraulic oils, heat-transfer oils, waxes, petro-chemicals, spray oils, solvents, others. Sun Oil Co.

383 Lubricant Data — Characteristics, advantages of company's line of specialized fluid and grease type lubricants are described in 32-pp Data Book 59-1. Includes sections on control of friction, use of grease type lubricants, proper applications, and recommendations for various operating conditions. Lubriplate Div., Fiske Brothers Refining Co.

HEATERS, HEATING

384 Unit Heaters—Advantages of heating with Thermolier unit heaters are detailed in 21-pp Catalog uh-57. Features, types, selection, application and maintenance are covered and capacities, dimensions, wiring and pip-

New Way to Stop Faucet Leaks!

★ 9-in-10 washers are fastened with TOO LONG or SHORT SCREWS thus loosen and destroy themselves. Leaks quickly follow!

34 YEARS OF RESEARCH REVEALS NEW SOLUTION

★ New, patented 'Sexauer' SELF-LOCK screws have imbedded expanding NYLON PLUG. They lock at required depth AUTOMATICALLY, hold washers firmly! Made of MONEL, they are rustproof, non-corroding. Heads can't twist off. Screw slots can't distort.

★ NEW, improved 'Sexauer' EASY-TITE faucet washers are made of super-tough, pliable du Pont compound (not rubber or fibre). Reinforced, like a tire, with a vulcanized layer of Fiberglas, they resist distortion and splitting from shut-off grind and squeeze.

★ Faucet leaks repaired with 'Sexauer' EASY-TITE washers and SELF-LOCK screws outlast ordinary repairs "6-to-1"!

HIDDEN COSTS OF FAUCET LEAKS!

Hackensack, N.J. Water Co. and American Gas Association figures prove stopping just ONE PIN-HOLE SIZE (1/32") LEAK saves you 8,000 gal. water quarterly. A HOT WATER FAUCET LEAK repair saves you over $7.58 QUARTERLY in fuel and water bills. Fewer leaks also produce important savings on MATERIALS, LABOR and COSTLY FIXTURE REPLACEMENTS!

A 'Sexauer' Technician will make available our NEW Catalog, Edition "J", listing our entire line of over 3,000 TRIPLE-WEAR plumbing repair parts and tools. He will survey your fixtures, determine the repair parts needed and establish an efficient stock arrangement and control to prevent costly overstocking or shortages. You get this service without obligation. *Act now!*

J. A. Sexauer Mfg. Co., Inc., Dept. S-89
2503-05 Third Ave., New York 51, N.Y.
Please send me a copy of your Catalog "J"
Name_____ Title
Organization_____
Bus. Address_____
City_____ Zone State

SEXAUER

For more facts circle 641 on Reply Card

A REPORT TO MANAGEMENT ON HOW

Industry cuts costs with FIR PLYWOOD

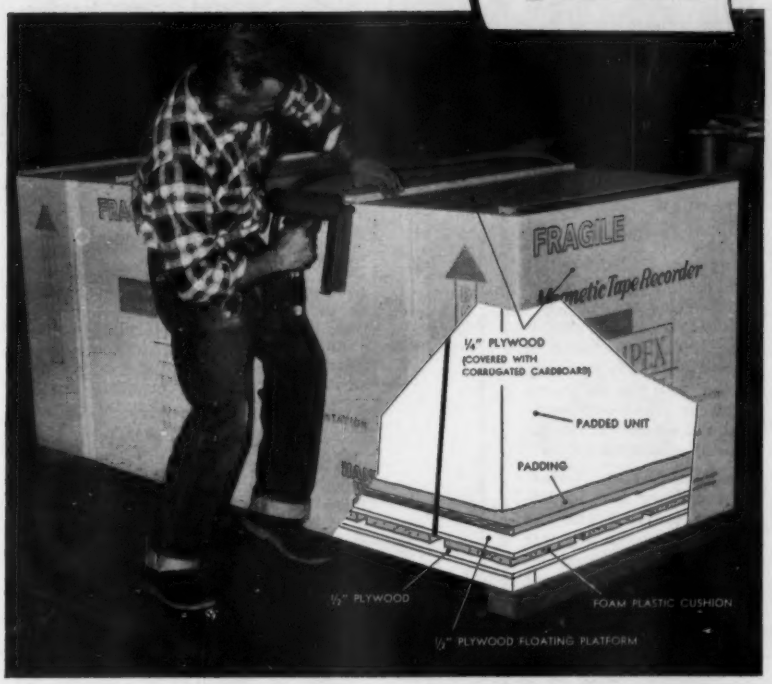
ROUTE TO:

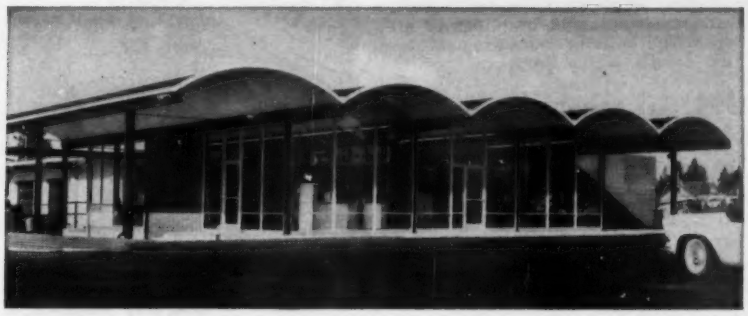
- ☐ ENGINEERING
- ☐ PRODUCTION
- ☐ SALES
- ☐ PURCHASING
- ☐ MAINTENANCE
- ☐ CONSTRUCTION
- ☐ _____

Prize Package—This unique fir plywood shipping container features a free-floating inner floor that virtually eliminates in-transit damage to delicate electronic equipment—yet it costs and weighs only half as much as the bulkier crates it replaces.

Adapted by Ampex Corp., Redwood City, Calif., from a system developed by North American Aviation, the container was an award winner at the packaging competition recently conducted by the Society of Packaging and Materials Handling Engineers.

Termed "free floating suspension" packaging, the system is keyed to a foam plastic-supported fir plywood platform to which the padded lading is securely strapped. Sides, top and bottom of the crate itself are also fir plywood. Plywood construction provides strength and rigidity without the penalty of extra weight, gives maximum impact and puncture resistance, and also simplifies fabrication and assembly.





Fir plywood vaulted roof components helped hold overall construction costs to $8.10 per square foot on this new Redi-Gas office-display-warehouse building in Tacoma, Washington. The multiple arch roof is composed of curved stressed-skin panels (each four feet wide and spanning 16 feet) which combine roof decking, finish ceiling and insulation. In addition to reducing on-site labor by as much as 80 per cent, the curved roof components permit large clear floor areas, spanning 16 feet without supplementary support from purlins or trusses. Each panel consists of Exterior fir plywood top and bottom skins glued to light lumber framing.

Plywood patterns help save hundreds of dollars monthly at Ryan Aeronautical Co. Fir plywood is cut to exact shapes of parts to be obtained from metal sheets and arranged for optimum cutting. Polaroid camera prints are rushed to production crews within minutes after the layout is approved.

FOR MORE INFORMATION about fir plywood—its uses, properties and advantages—write

DOUGLAS FIR PLYWOOD ASSOCIATION

TACOMA 2, WASHINGTON

—an industry-wide organization devoted to research, promotion and quality control

Always specify by DFPA grade-trademarks

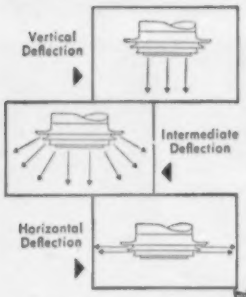
DFPA TESTED QUALITY

For more facts circle 642 on Reply Card

Fresh air at working level improves employee efficiency

Barber-Colman industrial Venturi-Flo diffuser permits air to be introduced at the worker's level—duct work can be extended to provide a 10′ mounting height. This prevents stagnant, smoky air, which has collected near the roof, from being mixed with the incoming fresh air. Employee comfort and efficiency are improved considerably.

The Venturi-Flo industrial diffuser can be adjusted easily from the floor to deliver any air pattern. In warm weather, the air should be delivered close to, or even directly at, the worker; while during cool evenings, or



in cold weather, the air should be diffused above the head of the worker, providing ventilation without drafts.

A complete range of sizes available to meet any industrial requirement. Ask for Bulletin F-7722-1. Call your Barber-Colman Field Office or write:

BARBER COLMAN

BARBER-COLMAN COMPANY

Dept. T, 1139 Rock Street, Rockford, Illinois

For more facts circle 643 on Reply Card

DATA FILE

(Begins on page 214)

ing diagrams, and sound ratings are included. Grinnell Co., Inc.

385 Heating and Ventilating—Company's "comfort curtain" principle of heating and ventilating is described in this 8-pp bulletin. Advantages are detailed and typical installations pictured through drawings and photos. Lennox Industries Inc.

386 Direct Fired Heaters—Complete description and specifications on unit heaters, duct furnaces and heavy duty heaters are presented in 12-pp Bulletin A1-1.2b. Cutaway views and construction features are included. Reznor Mfg. Co.

CONSTRUCTION

387 Foundation Pipe Piles—Comprehensive information on Taylor Forge spiral-weld foundation pipe piles is presented in 24-pp Form F-5677. In addition to detailed specifications, the illustrated booklet describes a number of pipe-pile installations and includes driving logs. L. B. Foster Co.

389 Wood Products—A variety of wood products and finishing materials for every type of construction are listed in this product bulletin. Reference guide lists grades, sizes and other data on lumber, plywood and hardboard. Georgia-Pacific Corp.

390 Unit Wall Construction—Twelve-pp Technical Bulletin UW-100-5 describes and illustrates application of company's Uniwall for complete single unit, moderate cost, wall construction in buildings of all types. The bulletin contains construction details. Natco Corp.

391 Structural Glass—Catalog 59-I contains essential data on company's line of rolled, figured and wired glass for a variety of industrial applications. Advantages and important functions are described, and light distribution tables and specifications are included. Mississippi Glass Co.

392 Replacement Glazing—Twelve-pp Booklet PL-251 gives detailed information on glazing industrial and other buildings with flat panels of the acrylic plastic, Plexiglas. Written for plant engineers concerned with frequent breakage of windows or other glazing problems, this practical booklet gives properties of this sheet. Plastic Dept., Rohm & Haas Co.

394 Fir Plywood—This 34-pp construction guide contains full-page structural drawings providing basic information on types, grades, and applications of fir plywood. Booklet covers information on floor construction. Douglas Fir Plywood Assn.

395 Industrial Doors—Features and advantages of company's automatic industrial door assemblies are illustrated and described in 8-pp Catalog 159. Dimensional drawings and photos showing details of design and operation given. Clark Door Co., Inc.

397 Non-Slip Flooring—Algrip, an abrasive rolled steel floor plate described as non-slip even on steel inlines, is the subject of Booklet AL-29, 8 pp. Discusses safety features, fabricating. Alan Wood Steel Co.

399 Guide to Shelving—To assist plant engineers in selecting proper shelving for all storage requirements, 64-pp Catalog 30 offers detailed suggestions for correct shelving and storing materials, loose and packed parts, record files. Shop equipment and storage cabinets are also described, and instructions included for planning of stockrooms. Deluxe Metal Furniture Co. Royal Metal Mfg. Co.

400 Aluminum Grating—Featured in this 8-pp bulletin is a line of aluminum grating designed for a variety of industrial applications. Safe load tablets and dimensional data and diagrams are included. Kerrigan Iron Works, Inc.

401 Safety Grating—Steel, aluminum and stainless steel safety grating for a variety of industrial applications is featured in illustrated 24-pp Catalog 5911. Shows typical installations, and includes complete engineering data for erection, as well as detailed load charts. The Globe Co.

RAIL AND TRACK EQUIPMENT

You can get everything you need for industrial track and crane runways—with one call to your nearest Foster office. Immediate deliveries from the nation's largest warehouser of rails (both new and relaying), switch material, and track accessories. Send for free catalogs and ordering guides.

Send for Catalog PE-8

L. B. FOSTER CO.

PITTSBURGH 30 • ATLANTA 8 • NEW YORK 7.
CHICAGO 4 • HOUSTON 2 • LOS ANGELES 5

For more facts circle 644 on Reply Card

402 **Grating and Threads**—Safety, visibility, permanence and easy maintenance are among advantages of open flooring discussed in 28-pp Bulletin 2527-R. Covers use of electroforged grating in a wide range of industries; also features grating applications in sidewalks, locks and dams, sewage treatment plants. Information provided includes types and spacing, bearing bar surfaces and weights, fastening methods, and safe loads for electroforged carbon steel and aluminum interlock grating. Blaw-Knox Co.

404 **Construction Service**—Twelve-pp Manual CS-5256 covers the scope, qualifications and benefits of company's construction service, a specialized service for those who want to buy any product installed. Includes descriptions and photos of types of work. Armco Drainage & Metal Products, Inc.

INSULATION

406 **Insulation Coating**—This 32-pp illustrated handbook, Form L-17, presents the advantages of company's No-Drip insulation coating for preventing condensation drip from metal, concrete, brick, wood, plaster, or composition surfaces. Lists applications. J. W. Mortell Co.

408 **Pipe Insulation**—Properties and advantages of fiber glass pipe insulation are detailed in Bulletin F-110. Tables list dimensional and packaging data, and specifications given. Pittsburgh Plate Glass Co.

409 **Building Insulation**—Twenty-pp Booklet FB-105 contains descriptive information on uses of cellular glass insulation on roofs, parking decks, core walls, wall linings, curtain walls, perimeters and ceilings. It contains drawings and specifications for typical applications, as well as technical data and charts. Pittsburgh Corning Corp.

410 **For Insulation Protection** — Comprehensive data on mastics, coatings, adhesives, and flashing compounds for thermal insulation has been classified as to industry usage —power, process, cold storage, marine and commercial—in this ready-reference loose-leaf manual, about 208 pp. Detailed application information and product data is included, as well as photos, drawings and diagrams of applications. Benjamin Foster Co.

MATERIALS HANDLING

412 **Electric Hoists** — Twelve - pp Bulletin DH 133D describes Speedway electric hoists of 500- to 4000-lb capacities. Fully illustrates and explains design features and gives details on suspensions and conducting systems. Clearance data included. Wright Hoist Div., American Chain & Cable Co., Inc.

413 **For Overhead Handling**—Booklet 2008-N 12 pp, is replete with illustrative material on principal com-

THE MARK OF QUALITY

BARBER COLMAN

New proportional regulator provides highly accurate control of temperature

For water, gas, or steam

Temperature ranges from −40° to +350° F

Calibrated temperature dial

Positive positioning

Fully proportional

Tight closing

High reliability

Self-contained

Easy-to-read valve position indicator

New Barber-Colman motor-operated proportional temperature regulators offer distinct advantages on any process or space heating or cooling applications requiring positive, accurate control.

Throttling range is adjustable from 2 to 25°. Auxiliary switches provide means of interlock to pumps, boilers, refrigeration compressors, etc. Optional features include speed adjustment, fail-safe spring return, and neutral band operator for heating/cooling.

Construction is exceptionally rugged and dependable. A positive-acting electric motor operator delivers full power throughout the complete valve operating stroke, assuring positive shutoff and accurate throttling. Motor operators are offered for use with most commonly used power sources. Motor and gear train are submerged in oil for long life and with minimum maintenance. A built-in feedback mechanism minimizes over- and undershooting.

Valve body types include single seat, double seat, three-way, single seat pilot balanced, and are available in bronze, iron, steel, and stainless steel. Available in screwed and flanged patterns for most sizes.

Regulators are sold complete, ready to install. For detailed specifications, call your local Barber-Colman Automatic Controls office, or write for descriptive literature.

"Better Control . . . Electrically"

BARBER-COLMAN COMPANY

Dept. T, 1339 Rock Street, Rockford, Illinois

For more facts circle 645 on Reply Card

One order, one source

. . . every fastener need

Where strength is a factor

HOT FORMED NUTS

. . . Induction heated

Through induction heating and modern forming equipment, these Screw and Bolt nuts attain superior finish, wrenching qualities and tolerances.

The instant heating process eliminates cold working strains prevalent in conventional cold made nuts, minimizing oxidation. Then modern equipment forms these nuts to geometric perfection and exceptionally close tolerances . . . for secure, snug-fitting connections.

When rugged operating conditions exist, be sure . . . specify hot formed nuts by Screw and Bolt. Send for illustrated brochure.

VMA 6733-B

SCREW AND BOLT CORPORATION OF AMERICA P. O. Box 1708 Pittsburgh 30, Pa.

Formerly Pittsburgh Screw and Bolt Corporation

America's Most Complete Line of Industrial Fasteners

DATA FILE

(Begins on page 214)

ponents of overhead handling systems. Track design and advantages of supporting it flexibly are described, and formulas and figures for comparing various track systems given. Cleveland Tramrail Div., The Cleveland Crane & Engineering Co.

414 Vibrating Conveyors—Advantages and features of vibrating conveyors are detailed in 16-pp Catalog 66. Layouts and flow charts showing how conveyors can be designed to perform a wide variety of processing operations at the same time the material is being conveyed are included. Ajax Flexible Coupling Co., Inc.

415 Continuous Power Conveyor—Featured in 64-pp Catalog A-93-R is a continuous power conveyor designed to meet the requirements for handling continuous production items. Component parts of the system, including track, chain, and suspension components, are fully illustrated and described. Installations in a variety of industries are illustrated. Richards-Wilcox Mfg. Co.

416 Vertical Transportation — Selection of vertical transportation for every traffic-moving job is detailed in 32-pp Bulletin A-382. Various types of elevators and escalators for a variety of commercial and industrial applications are described and illustrated. Otis Elevator Co.

Postage-free cards for ordering catalogs are on page 210. You may also use the cards to order literature mentioned in the ads.

417 Automatic Bulk Handling — Bulletin 531, 12-pp, on new techniques for automatic bulk handling describes pneumatic conveying methods in integrated manufacture. Describes two polyethylene handling installations to show how a system approach to air conveying solves complex handling problems. Dracco Div., Fuller Co.

418 Material Handling System — How production, storage and material movement can be simplified, speeded-up and integrated with the use of Work-O-Matic units is detailed in 10-pp Catalog 89. Photos illustrate use. The Union Metal Mfg. Co.

419 Sheet and Coil-Lifters—Bulletin SL-30, 16 pp, illustrates and describes various types of standard and semi-special lifters for one-man or automatic handling of sheet and coil stock. Advantages and design features are detailed and tables listing dimensions included. Cullen-Friestedt Co.

420 Adjustable Ramps—Engineering details and other information on

PAGE CHAIN LINK FENCE

Fence value depends on
—quality materials
—quality installation
You get both from PAGE

New Aluminized Fabric!
(other quality fabrics available: galvanized steel, aluminum, stainless steel)

8 basic fence designs
6 gate styles

Expert installation by specialists

Registered Certificate of Quality furnished to property owner

Good fences—since 1883

Write for helpful booklet

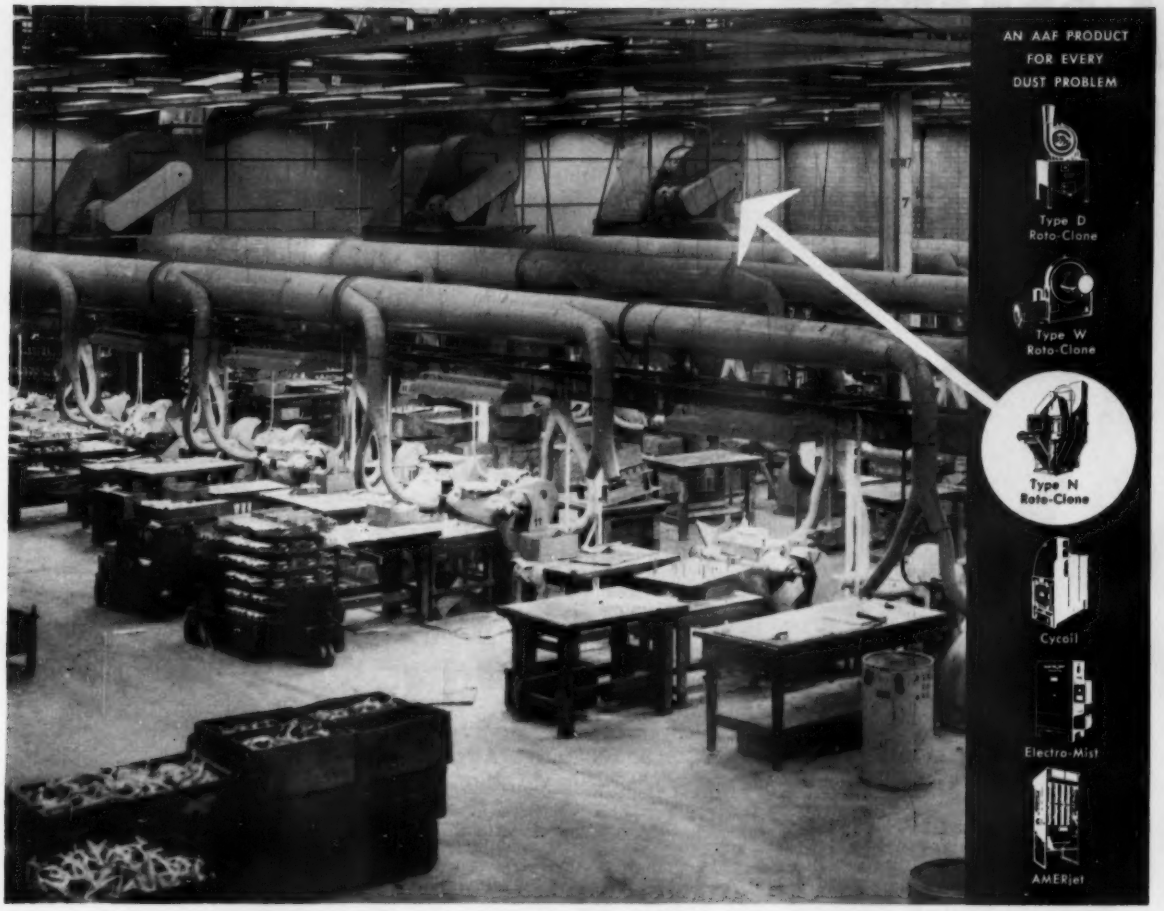
PAGE FENCE ASSOCIATION
National Headquarters • Monessen, Pa.

A product of Page Steel & Wire Division
American Chain & Cable Company, Inc.

For more facts circle 647 on Reply Card

← For more facts circle 646 on Reply Card

BUFFING



AAF Type N ROTO-CLONES stop dust for Electric Auto-Lite

● This sparkling clean buffing area in Electric Auto-Lite's Lockland, Ohio, plant is visible proof of the effectiveness of AAF's Type N ROTO-CLONE. These rugged wet collectors are exhausting 80,000 cfm from manual buffing of die-cast auto accessory parts.

AAF's complete line of dust control equipment was application-developed, now challenges *any* metalworking dust problem. Where are dust, fumes or mists causing you trouble – grinding, buffing, polishing, dry machining, wet machining, heat treating, abrasive cleaning? All can be effectively and economically controlled by AAF.

If buffing dust is your problem, call your local AAF representative, or write direct for Type N ROTO-CLONE Bulletin 277. Address Mr. Robert Moore, American Air Filter Company, Inc., 228 Central Avenue, Louisville, Kentucky.

AAF **American Air Filter**

BETTER AIR IS OUR BUSINESS

For more facts circle 648 on Reply Card

NEED A PROCESS FAN?

READILY AVAILABLE:

WESTINGHOUSE RUGGED, VERSATILE FANS for handling air, gas, fumes, vapors in industrial processes . . . also in a variety of types for ventilation and materials handling.

Call your nearest Sturtevant Division Sales Engineer—or write Westinghouse Electric Corporation, Hyde Park, Boston 36, Massachusetts.

J-80681

YOU CAN BE SURE...IF IT'S

Westinghouse

Plants at Hyde Park, Massachusetts; La Salle, Illinois; Berkeley, California.

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV MONDAYS

For more facts circle 649 on Reply Card

DATA FILE

(Begins on page 214)

use and installation of company's hydraulic adjustable ramps for loading docks are featured in this illustrated bulletin. Two types of dock equipment are treated—Adjust-A-Dock, installed in loading platform or at its level, and Adjust-A-Truck, at ground level. Rowe Methods, Inc.

SLINGS, CHAINS, WIRE ROPE AND FITTINGS

422 Self-Lubricating Chain—Bulletin SLC-57 describes and illustrates exclusive, oil-impregnated sintered bushing design feature of company's self-lubricating roller chain. Engineering data, dimensions and application covered. Whitney Chain Co.

423 Drop Forged Fittings—Comprehensive data on company's line of drop forged fittings for wire rope and chain are presented in 40-pp Catalog 950-2. Includes specifications, dimensions, rated capacities and weights. Crosby-Laughlin Div., American Hoist and Derrick Co.

424 Wire Rope Manual—"Inspection of Wire Rope," "Methods of Lubricating Wire Rope," "Use and Abuse of Wire Rope," and "Sheave Maintenance" are among subjects covered in this 188-pp Wire Rope Manual, Catalog G-16. In addition, there are sections devoted to strengths and weights of wire rope, cable assemblies, and rated capacity of slings. Manual is available to qualified plant engineers. Macwhyte Co.

TOOLS, WELDING, AND MACHINE SHOP

425 Pipe Tools—Ordering and application information on Rigid pipe tools is provided in 16-pp illustrated Catalog 7596R-6. Wrenches, cutters, threaders, reamers, vises, and others are pictured and described, also power drives. The Ridge Tool Co.

427 Powder Actuated System—Two booklets cover applications of a powder actuated fastening system. One booklet shows how it can be used for plant maintenance—fastening conduits, bus ducts, junction and outlet boxes, surface raceways, fixtures and frames, etc. The second booklet indicates the correct fastening and charge to use to fasten materials to concrete or steel. Ramset Div., Olin Mathieson Chemical Corp.

428 Portable Electric Tools—Form 10 features a complete line of portable electric tools including drills, screw-drivers, impact wrenches, magnetic drill presses, sanders, grinders, hammers, holesaws, and forged tools. The Black & Decker Mfg. Co.

429 Where to Use Your Stud Driver—Twenty-pp pocket-size Form 955 describes and pictures applications of studs, using company's Model 450 stud driver. Provides some operating hints and safety precautions and

JOIN TWO LENGTHS SIMPLY BY SCREWING

No more collars or clamps! Exclusive Wiremold Air Duct construction makes possible this sure coupling method. And, air flow is not restricted. Save time; save odd lengths for neat use on next job. Why not write for full story, or ask your DISTRIBUTOR?

FOR AIR CONDITIONING / EXHAUSTING MATERIALS HANDLING / MANY OTHER USES

WIREMOLD®

AIR DUCT

THE WIREMOLD COMPANY • HARTFORD 10, CONN.

For more facts circle 650 on Reply Card

NATIONAL ELECTRIC DIVISION

SMOOTH BAKED ALUMINUM INTERIOR

ELECTRO-GALVANIZED EXTERIOR

EMT BY NATIONAL ELECTRIC NOW FINEST IN THE INDUSTRY

NEW INDUCTION WELDING *gives smoother seams . . . seams that are actually stronger than the metal itself.*

Continuous Testing Protects Product Quality

1. Rockwell tests for hardness
2. Strength tests for weld and durability
3. Bendability tests to measure workability
4. Torque wrench tests to measure lbs. per sq. inch pressure
5. Expansion tests over mandrel (4 to 6 times per day)
6. Gauge tests to check strip variation

Inquire at your local National Electric Distributor or write now to: *National Electric Division, H. K. Porter Company, Inc., Porter Building, Pittsburgh 19, Pa.*

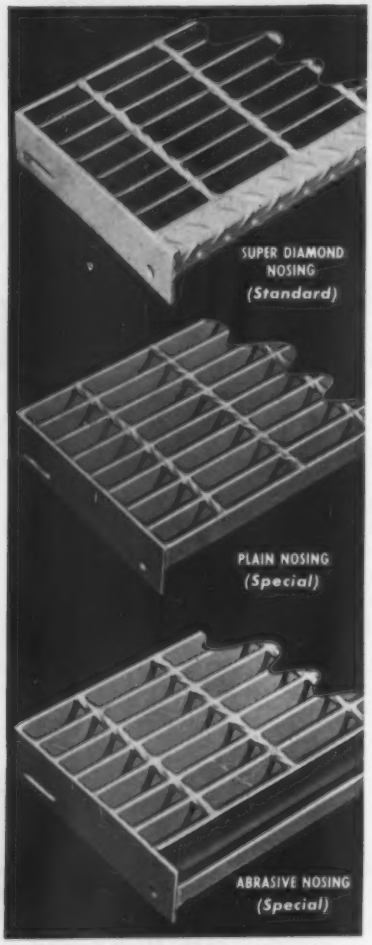
EASY TO BEND: *High ductility makes possible difficult bends and offsets. Fast, easy fishing.*

NATIONAL ELECTRIC DIVISION PORTER ***H.K.PORTER COMPANY, INC.***

PORTER SERVES INDUSTRY: with Rubber and Friction Products—THERMOID DIVISION; Electrical Equipment—DELTA-STAR ELECTRIC DIVISION, NATIONAL ELECTRIC DIVISION; Copper and Alloys—RIVERSIDE-ALLOY METAL DIVISION; Refractories—REFRACTORIES DIVISION; Electric Furnace Steel—CONNORS STEEL DIVISION, VULCAN-KIDD STEEL DIVISION; Fabricated Products—DISSTON DIVISION, FORGE AND FITTINGS DIVISION, LESCHEN WIRE ROPE DIVISION, MOULDINGS DIVISION, H. K. PORTER COMPANY de MEXICO, S. A.; and in Canada, Refractories, "Disston" Tools, "Federal" Wires and Cables, "Nepcoduct" Systems—H. K. PORTER COMPANY (CANADA) LTD.

For more facts circle 651 on Reply Card

FOR
PLANT
SAFETY
AND
ECONOMY
SPECIFY
KERRIGAN
Weldforged
GRATING & TREADS



Note how spirals in cross bars alternate right and left and are slightly raised above bearing bars for an extra margin of safety.

SEND FOR
FREE CATALOG
Address Dept. PL-8
KERRIGAN IRON WORKS CO.
Nashville 2, Tennessee

For more facts circle 652 on Reply Card

DATA FILE

(Begins on page 214)

covers use of studs through steel into concrete, wood into concrete, wood into steel and steel into steel, as well as their use in attaching pre-drilled fixtures. Remington Arms Co., Inc.

430 Welding Positioners—Illustrated and described in 16 pp Bulletin P-28 is a line of welding positioners ranging from 3000 to 100,000 lb capacity. Features and advantages are detailed, and dimensional diagram, and load tables included. Harnischfeger Corp.

431 Welding Wires — Submerged arc and inert gas welding wires are featured in Bulletin DH-402-C. Typical applications of various stainless steel, low alloy, and mild carbon steel automatic welding wires are described. Page Steel & Wire Div., American Chain & Cable Co., Inc.

432 Soldering Aluminum—Detailed information on soldering aluminum is presented in this reference bulletin. Includes data on soldering fluxes, irons and flames, and gives information on soldering methods, such as hot plate, dip, furnace, friction, glass fiber brush and ultrasonic operations. Reynolds Metals Co.

433 Data for the Shop—"Fluids and Facts for Metal Working" is a pocket-size booklet of about 44 pp. A section on metal working fluids covers their function and selection, preparation and use of soluble oils and paste compounds, and prevention of dermatitis. Conversion tables, steel numbering systems, machinability ratings. Standard Oil Co. (Ind.)

434 Vibration, Noise Control—Eight-pp Booklet K4E gives engineering specifications and performance data for 27 types of products for control and measurement of machinery vibration, shock and noise. Installation photos show solutions to typical problems. Discusses relative merits of steel springs and organic materials as isolation media. A selector chart covers a wide range of equipment, showing recommended and suitable alternate methods of isolation. The Korfund Co., Inc.

MECHANICAL POWER TRANSMISSION

435 Fluid Drive—Eight-pp Bulletin 9819 describes and illustrates adjustable speed Gyrol fluid drives, 1- through 25-hp, giving advantages and applications. Components and operation are covered in detail and selection tables given. Industrial Div., American-Standard.

436 Flange Mounted Drives—Bulletin 7140 contains selection data for flange mounted drives for a variety of applications. A load classification table is included, as well as tables of minimum sheave pitch diameters,

FREE Quick Reference CATALOG F-10R

OPW KAMLOK for hose and pipe
QUICK COUPLING ASSEMBLIES

Lots of illustrations clearly show the complete interchangeability of master gauged Kamloks. Detailed recommendations and sizing charts, typical specials for unique installations and factual information will help you in planning, selection and determining installation.

Just write us on your letterhead.

OPW-JORDAN
JORDAN CORPORATION
DIVISION OF OPW CORPORATION
6013 Wiehe Road, Cincinnati 13, Ohio EL 1-1352
For more facts circle 653 on Reply Card

REMEMBER

PALMETTO Packings pack more performance into every application

GET THEM at any industrial distributor authorized to carry Palmetto Packings . . . For the name of a supply house near you consult our insert in Thomas Register—between pages 4816-4817.

GREENE, TWEED & CO.
North Wales · Pennsylvania

For more facts circle 654 on Reply Card

THE U. S. TREASURY SALUTES THE RAILROAD INDUSTRY

—and its thousands of employees who help strengthen America's Peace Power by buying U.S. Savings Bonds

Each year our railroads carry some half a billion passengers and 2½ billion tons of freight. Railroad employees, who keep this vital transportation system running, help in another substantial way to support our national security. Thousands upon thousands of them are buying U. S. Savings Bonds, regularly, through the Payroll Savings Plan.

Regular purchases of Shares in America aid these thrift conscious people in building up their own reserves for the future. The Payroll Savings Plan provides a sound, systematic way to help finance homes, education and increase security after retirement.

Has your company put in a Payroll Savings Plan? If not, start now! A telephone call to your State Savings Bonds Director will bring prompt and understanding help in putting the Plan to work. Call him now. Or write Savings Bonds Division, U.S. Treasury Department, Washington, D.C.

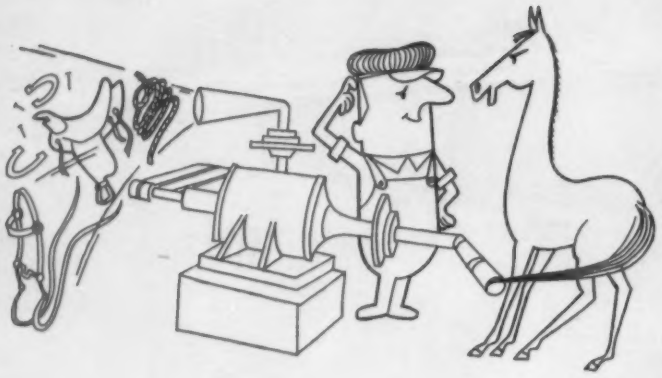
WESLEY J. HENRY, experienced engineer with one of America's great railroads, is typical of thousands of highly trained employees in this field who are buying U.S. Savings Bonds regularly. Mr. Henry uses his company Payroll Savings Plan to make a personal contribution to the Peace Power of his country.

PLANT ENGINEERING

THE U. S. GOVERNMENT DOES NOT PAY FOR THIS ADVERTISEMENT. THE TREASURY DEPARTMENT THANKS, FOR THEIR PATRIOTISM, THE ADVERTISING COUNCIL AND THE DONOR ABOVE.

WEMCO® the INCREDIBLE Torque-Flow Pump

pumps almost everything
(what will go in will come out)



secret: recessed impeller; continuous open passage
(maintenance a thing of the past)

Western Machinery Company 650 Fifth Street • San Francisco, Calif.

For more facts circle 656 on Reply Card

ESTERLINE-ANGUS
The Only Complete Line of Direct-Writing Graphic Meters
...for accurate and permanent records

Ammeters (AC and DC)
Voltmeters (AC, DC and AC-DC)
Wattmeters (AC, DC and AC-DC)
KVA and KVAR Recorders
Power Factor Recorders
Frequency Recorders
Contact-Making Instruments
DC Milliammeters
Operation (Event) Recorders
Speed Recorders
Pressure and Vacuum Recorders
Position and Motion Recorders
Rectifier Type Meters
—for AC-DC Amperes, Volts

... with the largest selection of Chart Drives: *Hand-Wound Spring; Motor-Wound Spring; Synchronous Motor; Selsyn; Phantom;* and *High Chart Speed Attachments.*

For further information, send for Catalog No. 657

The Esterline-Angus Company, Inc.
More than 50 Years Manufacturing Graphic Instruments
Dept. J, P. O. Box 596, INDIANAPOLIS 6, INDIANA

For more facts circle 657 on Reply Card

DATA FILE

(Begins on page 214)

load location factors, overhung load capacities. The Falk Corp.

438 Motors and Drives—Eight-pp Bulletin 2650 describes company's line of a-c and d-c standard motors, special motors, gear motors and adjustable speed drives, for a broad range of industrial applications. Summarizes characteristics and modifications for 20 basic types of motors and drives. The Louis Allis Co.

439 Transmission Belting—Application information on company's line of transmission belting is presented in 16-pp Bulletin S-5174. Specific types of belting for a variety of applications is illustrated and described, and technical data tables, and a selection table for drives included. The Goodyear Tire & Rubber Co.

440 Power Transmission Equipment—Featured in 48-pp Book 2747 is a line of gearmotors, Motogears and fluid drives for power transmission applications. Advantages of design and operation are detailed, and comprehensive selection tables are included, as well as photos, cutaway views and diagrams showing component features. Link-Belt Co.

441 Anti-Friction Bearings—Catalog 424-B, entitled "The broadest line in the anti-friction field," is an 8-pp folder giving capsule presentation of company's entire product line. A brief description of each product is provided. SKF Industries, Inc.

442 Flexible Couplings—Condensed Engineering Catalog 51-A contains excellent data on the choice and use of company's flexible metal couplings for power transmission. Tells advantages of these couplings. Thomas Flexible Couplings Co.

SEALS, PACKING

444 Piston Packing — Sixteen-pp Bulletin 5503 presents engineering data on Darcova Pumcups for packing pistons of air cylinders, hydraulic cylinders and reciprocating pumps. Included are operating diagrams and a list of typical installations, as well as helpful data on Pumcup compositions. Darling Valve & Mfg. Co.

445 Self-Lubricating Packings — Featured in this 30-pp Bulletin PC-103 is detailed information on company's line of packings with internal lubrication. Application chart, table of physical properties, and ordering instructions are included. Greene, Tweed & Co.

446 Metal Packing — Featured in 24-pp Form AD-166 is detailed information on selection of metal packings for use wherever gas or air is compressed or expanded. Covers free-floating metal packings, metal rod packing rings, metal scraper rings,

metallic or non-floating packings, rings. The Garlock Packing Co.

ELECTRICAL

447 Rerated Integral HP Motors—Bulletin 520 describes polyphase open-protected motors in re-rated NEMA frames. Ratings through 200 hp. Motor Div., Robbins & Myers, Inc.

448 Unit Substations—Tranfo-Units—packaged, compact unit substations—are described in 16-pp Bulletin 5604-1A. Provides basic design, application and specification information of value in selecting integrated combinations of equipment. Consisting of transformer with primary and secondary switchgear, these units permit voltage step-downs at the load area. Ratings, dimensions, weights and outline drawings of 16 types of Tranfo-Units, specifications provided. I-T-E Circuit Breaker Co.

449 Motor Protectors — Questions and answers about company's built-in, three-phase motor protectors are designed to describe features and advantages of these control units. Typical applications are illustrated in Bulletin PR-1243. Metals & Controls Corp.

450 Circuit Breakers Panelboards—Bulletin 306 describes plug-in circuit breaker panelboards for automatic protection of a-c or d-c lighting and appliance circuits. Capacity data is included, as well as typical wiring diagrams, table of catalog numbers, ratings and sizes, and specifications. Frank Adam Electric Co.

451 Protective Relays—Featured in 16-pp Catalog 5-020 are time delay overcurrent relays, directional inverse time overcurrent relays, differential relays, instantaneous overcurrent relays (adjustable setting), inverse time voltage relays, auxiliary relays, ac-dc definite time relays, and reclosing relays. For each model, tabular data and photos cover its applications. Federal Pacific Electric Co.

452 Hydraulic-Magnetic Breakers—Bulletin 301, 16 pp, describes advantages and operation of company's hydraulic-magnetic circuit breakers. Design and construction features are detailed and time-delay curves, specifications and dimensional data included. Heinemann Electric Co.

453 Portable Distribution System—Described in this 30-pp Catalog PC-58 is a portable distribution system for electric lighting and power, including such applications as portable lighting, heating and ventilation equipment, welding machines, power tools, and lighting transformers. System diagrams showing how each unit fits are included. Whitney Blake Co.

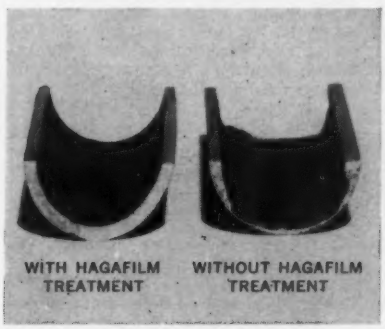
454 Distribution Equipment — Detailed information on company's line of electrical distribution equipment is presented in 82-pp '59 Marketeer, Catalog M-159. Among equipment described are Electrostrip multi-outlet assemblies, switches, lighting panelboards, power panelboards, switchgear assemblies, and various types of electrical duct. Tables of essential data. BullDog Electric Products Co., Div. I-T-E Circuit Breaker Co.

455 Electrical Equipment Digest—Electrical equipment illustrated and described in 160-pp Catalog Digest 142, includes load centers, circuit breakers, low voltage control, fusible service equipment and accessories, meter sockets and troughs, safety switches, panelboards, duct and fittings, starters. Square D Co.

456 Silicone Rubber Insulated Cables — Performance characteristics of silicone rubber insulated cables are detailed in 16-pp Form 682. Physical properties and electrical characteristics of silicone rubber are given, and applications illustrated and described. National Electric Div., H. K. Porter Co., Inc.

457 Portable Electrical Cable—Detailed information on portable electrical cable for a variety of industrial applications is presented in this condensed catalog. Basic construction covered. Western Insulated Wire Co.

458 For High Voltage Cable—Test results and service records on an improved butyl rubber compound for high-voltage cables are announced in 12-pp Bulletin EB-27. Covers resistance to ozone, operating temperature,



Central generating station, U.S. Bureau of Mines, Bruceton, Pa. Hagafilm, in use here since 1951, is added with the boiler feedwater to form a protective film on condensate lines.

Quick case history—reading time 58 seconds

How U. S. Bureau of Mines protects miles of condensate lines with Hagafilm

THE PLANT: The U.S. Bureau of Mines experimental station occupies a 259 acre tract of land at Bruceton, Pa. Process and heating steam is generated at a central boiler plant by four 250 H.P. units. There are several miles of steam and condensate return lines connecting the boiler plant with over 100 steam-using buildings.

THE PROBLEM: Plant records showed continuously high maintenance and replacement costs for condensate return lines, traps and valves. Corrosion rates, as measured by pre-weighed test specimens, were 56 mg/dm²/day. (25 mg/dm²/day indicates serious corrosion.) Because of the considerable distances involved, an extremely active and well distributed inhibitor was required to protect vulnerable return lines against oxygen pitting as well as low pH carbon dioxide grooving.

THE SOLUTION: Hagafilm met the Bureau's requirements. A long chain amine inhibitor, Hagafilm forms a non-wettable, protective film on surfaces contacted, starting from the point of condensation. It was initially shot-fed four times daily to the operating boilers at a rate of 2 ppm, based on steam produced. Subsequently, the feed rate was reduced to 1 ppm. Once an adequate film was formed, less Hagafilm was needed to keep the lines in good condition.

TEST RESULTS: Corrosion rates have dropped to 2.7 mg/dm²/day. Trap maintenance and pipe replacements are now almost nonexistent. The top photo illustrates Hagafilm's ability to protect lines from corrosion problems. The pipe section at the right developed a dangerous degree of corrosion after 10 years service without Hagafilm . . . the section at the left shows negligible corrosion effects after 7 years use with Hagafilm added.

FOR FULL INFORMATION on how Hagafilm can solve your corrosion problem safely, quickly and economically, write for bulletin 410-12-7 or contact:

HAGAN CHEMICALS & CONTROLS, INC.
DIVISIONS: CALGON COMPANY, HALL LABORATORIES
HAGAN BUILDING, PITTSBURGH 30, PA.
In Canada: Hagan Corporation (Canada) Limited, Toronto

For more facts circle 658 on Reply Card

DATA FILE

(Begins on page 214)

high-voltage, dielectric strength, aging, insulating resistance, absorption. Anaconda Wire & Cable Co.

459 Wiring Devices — Catalog 60, about 80 pp, presents ordering data on wiring devices including a wide range of switches, convenience outlets, lampholders, fluorescent devices, cord connectors, adapters, wall plates, accessories etc. Fully illustrated with photos, catalog provides condensed information on features, dimensions, applications. Pass & Seymour, Inc.

460 Metal Raceways — Pocket-Size Catalog and Wiring Guide 21, 144 pp, covers surface metal raceways and fittings, multi-outlet systems, fluorescent and slimline lighting equipment, and non-metallic flexible conduit, with detailed installation instructions. Catalog lists fittings, covers fastening methods, wiring for spotlights, graphical electrical symbols, and provides illustrations of various types of installations. The Wiremold Co.

METALS

462 Aluminum and Steel Data—Comprehensive selection data on aluminum and steel available in stock for almost every application is presented in this 242-pp buying guide. Necessary weights, dimensions and descriptive data are tabulated. Individual sections cover structural shapes, construction products, plates, sheets, hot rolled bars, cold finish bars, alloy and tool steel, tubing, stainless steel, aluminum, others. Joseph T. Ryerson & Son Inc.

463 Molybdenum in Steel Castings —This 36-pp brochure on the role of molybdenum in steel castings for industrial equipment discusses hardenability, tensile properties, fatigue, hardness, wear and impact resistance, machinability, and weldability of cast steels. Climax Molybdenum Co.

OTHER EQUIPMENT

464 Industrial Finishing Equipment—Catalog A657, 12 pp, describes modern finishing system for cleaning, rust proofing, drying, painting and finish baking. The R. C. Mahon Co.

465 Preheating Combustion Air—This well-illustrated 36-pp booklet explains fuel savings and increased performance made possible by using waste heat in flue gases to preheat incoming combustion air. Also covers increased boiler output, ability to use lower grade fuels effectively. Air Preheater Corp.

466 Tripod Elevated Tank—This illustrated bulletin describes the Horton tripod elevated water tank, designed to provide economical gravity water pressure for general service and fire protection in private water systems, others. Standard sizes included. Chicago Bridge & Iron Co.

467 For Cleaner Furnace—The use and application of Oxi Crystals to keep furnaces and the fireside of boilers free of slag, encrusted carbon, soot and fire-scale is described in a recent pamphlet. Oxi Corp.

468 On Coal Crushers—Five bulletins describe reduction machinery for coal, alum, bones, salt, chemicals. Bulletins 937 and 939 cover single roll crushers and flextooth crushers. Bulletin 938 deals with manufacturer's single roll Stokerkol sizer for production of premium size stoker coals. Bulletin 940 covers the Flexroll coal crusher for reducing small capacities of coal to stoker sizes. Leaflet 949 describes a heavy duty slugger crusher. Jeffrey Mfg. Co.

469 Product Directory—This product directory provides a basic source of information on company's divisions and products. Products are divided into major sub-groups—chain link fence, chemicals and coke, springs, belts, wire, wire cloth, etc. The Colorado Fuel and Iron Corp.

470 Cooling Towers — Featured in 20-pp Catalog DFA-58 is company's double flow Aquatower, combining high efficiency with low silhouette. Specifications and engineering data are included, as well as dimensional drawings showing construction features. The Marley Co.

471 Cold Plates — Described in Form P7 is company's line of cold plates and assemblies for refrigeration applications. Features and applications described. Dean Products, Inc.

472 Laboratory Supplies—This 12-pp price list announces the latest prices for a wide range of laboratory supply items, including water analysis sets, conductivity equipment, colorimetric comparators, laboratory glassware and supplies, chemical reagents. Betz Laboratories, Inc.

474 Plastic-Cored Belt—Detailed information on company's plastic-cored

What BRONCO PATENTED* branding means to you!

You know your electrical cords and cables are the toughest you can get when you find this name molded* indelibly into the outer 67.32% Neoprene jacket.

YOU KNOW YOU ARE GETTING WHAT YOU ORDERED

67.32% NEOPRENE TYPE W 3 COND #8

HIGHEST NEOPRENE CONTENT IN THE INDUSTRY to give your cable maximum protection from oil, heat, acid, abrasion, etc.

TYPE AND SIZE are molded* into the jacket as well as rated voltage & "P116BM," Bureaus of Mines official approval number.

SELF-MEASURING — Branding* is repeated every two feet exactly. Want 20 feet? Count 10 Broncos and cut.

*U.S. PATENT #2867001

Write for free sample!

WESTERN INSULATED WIRE CO., LOS ANGELES 58, CALIF.

For more facts circle 659 on Reply Card

CLASSIFIED ADVERTISING

EQUIPMENT FOR SALE

IT IS NO SECRET

In our bulletins nothing is kept secret about the DEAN THERMO-PANEL COIL which TAKES THE PLACE of old-style pipe coils. Patented and Patents Pending. Complete data and prices on request. Latest models assure INCREASED CAPACITY.

DEAN THERMO-PANEL COIL DIVISION
DEAN PRODUCTS, INC. 622 Franklin Ave.
BROOKLYN 38, N. Y. Tel. Stirling 9-5300

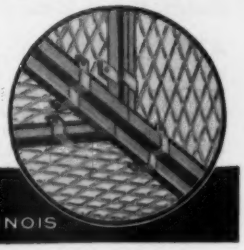
GLOBE SAFE·GARD EXPANDED METAL PARTITIONS with exclusive QUIK-ERECT patented fittings

(FORMERLY HILMAR)

...will answer all your enclosure problems

Here is the new, easier, simpler method of guarding conveyors and machines and for all in-plant partitioning. Shipped READY for erection, no cutting, drilling or welding required . . . these interchangeable expanded metal panels provide greater safety, cut overall costs, cover a wider range of use and require 85% less storage space.

EXCLUSIVE QUIK-ERECT SECTION CLIPS save much of the erection time formerly required. Proven successful in hundreds of installations, these Safe•*Gard* panels are of welded construction, give longer life, are more rigid and stronger than wire, will not ravel or fray.



Note enlarged detail showing SAFE•GARD Quik-Erect Clips securely joining the interchangeable panels.

Write today for more details or call your Globe (Grip-Strut) Distributor.
Distributors in all principal cities, listed under "Grating" in your phone book.

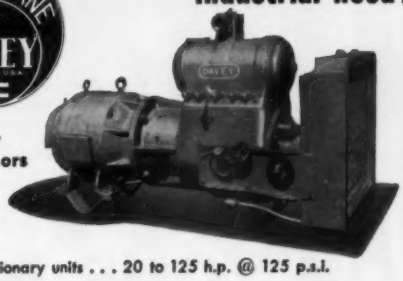
114

PRODUCTS DIVISION | **THE GLOBE COMPANY**
4016 SOUTH PRINCETON, CHICAGO 9, ILLINOIS

For more facts circle 660 on Reply Card

HYDROVANE DAVEY

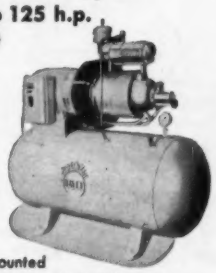
NEW... **meets every industrial need!**



Rotary Compressors

Stationary units . . . 20 to 125 h.p. @ 125 p.s.i.

- ✓ **Silent . . . vibrationless . . . compact**
- ✓ **Complete line . . . 2 to 125 h.p. . . . 8 to 500 c.f.m. @ 125 p.s.i.**
- ✓ **No complicated engineering . . . no compressor room . . . no foundation**
- ✓ **Easy to install and operate**
- ✓ **Air cooled or water cooled**



Tank mounted
2 to 5 h.p. @ 100-200 p.s.i.

Write for Bulletin M-132

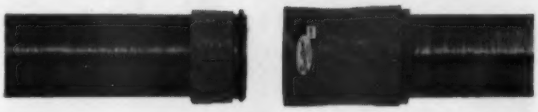
INDUSTRIAL DIVISION

DAVEY pioneers of "air-cooled air."

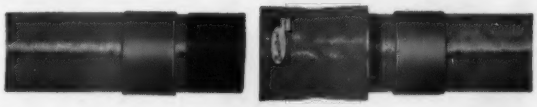
DAVEY COMPRESSOR CO.
Kent, Ohio

For more facts circle 661 on Reply Card

BONDSTRAND®



fiber-glass reinforced epoxy pipe by Amercoat®



. . . strong as steel pipe, only one-eighth the weight. Tensile: hoop 80,000 psi, longitudinal 40,000. Highly corrosion resistant. Won't scale, cold flow or deform. 20-foot lengths easy to cut and join; threaded or locking wedge fittings.

MOST COMMON DIAMETERS AVAILABLE

Write for BONDSTRAND technical brochure

Amercoat CORPORATION

Dept. LH • 4809 Firestone Boulevard
South Gate, California

114A

For more facts circle 662 on Reply Card

DATA FILE

(Begins on page 214)

belting is presented in two bulletins. One presents design and application data as well as selection tables, on Tanastic—a plastic-cored flat belt with chrome leather. The other bulletin covers Texalon—a combination of woven textile and flat ribbons of extruded nylon. J. E. Rhoads & Sons.

475 Heat Exchangers—General information and selection data on company's line of heat exchangers designed for heating liquids with steam is presented in 12-pp Bulletin GN-1054. Applications are illustrated and described. Bell & Gossett Co.

476 Fire-Resistant Fluids — This series of specification sheets describes company's line of fire-resistant fluids, including synthetic, oil-water emulsion, and glycol types. Physical characteristics and other data on each included. Socony Mobil Co., Inc.

477 Coagulant Aids—Featured in this product bulletin is a line of coagulant aids designed to improve floc formation in clarifying and softening water. Advantages are detailed. Calgon Co., Div., Hagan Chemicals & Controls, Inc.

478 Equipment Selector Charts—Bulletin CE-50, 20 pp contains selector charts on corrosion-resistant equipment for process industries. Tables cover general considerations in selection of material, physical properties corrosion resistance, techniques and skill in manufacture of equipment. Describes rubber and plastic pipe, tubing and fittings, valves, pumps. Amerace Corp., American Hard Rubber Div.

479 Mechanical Steel Tubing—Electric-resistance welded mechanical steel tubing for a variety of industrial applications is featured in 8-pp Bulletin RCP-960. Photos showing tubing subjected to various tolerance tests are included, as well as details on fabrication and specifications. Rome Cable Corp.

480 Paint Finishing Systems — A series of six articles on paint finishing systems is presented in this 20-pp bulletin. Articles cover conveying systems, system layout, equipment for metal preparation, ovens, methods of paint application, and auxiliary equipment. J. O. Ross Engineering Div., Midland-Ross Corp.

481 Fluid Mixers—Advantages and mechanical features of company's industrial mixers designed for a variety of fluid mixing operations are detailed in a series of bulletins available in this ring-bound notebook, containing Bulletins B-102, 103, 104, 108 and 111. Selection tables, outline dimensions and photos of typical applications are included, as well as specifications, mixer capacity tables, photos. Mixing Equipment Co., Inc.

482 Consulting Service — Advantages of company's consulting service are detailed in 8-pp Bulletin 5006-A. How the service is qualified to solve problems concerning scale and corrosion control in boilers, cooling systems, and process waters is discussed. Dearborn Chemical Co.

483 Testing Skin Cleansers — The use of radioactive material to check the cleansing efficiency of various materials and formulas used in production of skin cleansers by this manufacturer is described in this brochure. Basic steps in test shown. The Sugar Beet Products Co.

484 Thermoplastic Polymer — Information on the properties of Penton, thermoplastic polymer, is presented in this 6-pp brochure. Lists mechanical, electrical and chemical properties and describes molding methods. Hercules Powder Co.

485 Chain Link Fencing—A comprehensive review of aluminum's role in the growing fence market today is presented in this 12-pp booklet. Outlines details of typical installations of aluminum chain link fence. Complete technical data on strength, resistance to corrosion, and durability is presented. Tensile strengths, as well as suggested aluminum alloys, are included. A companion publication gives suggested specifications. Aluminum Co. of America.

DUSTKOP "520"
designed to collect dust from single machines
portable—easily installed

DUSTKOP STOPS DUST

Self-contained Dustkop models, like the "520," are practical and effective in collecting dust from single machines. They're designed specifically for service with surface grinders, tool and cutter grinders, offhand grinders, buffers and other small wheel equipment. These units are also easy to install — are actually portable — and very economical to operate.

Write for illustrated literature
46 models to choose from!

NEW DUSTKOP AUTO SHAKER shakes filters AUTOMATICALLY

AGET manufacturing company
1388 E. Church Street, Adrian, Michigan
ask for details

For more facts circle 663 on Reply Card

REPAIR FOR YOUR B&D TOOLS

For genuine Black & Decker repairs check Yellow Pages under "Tools-Electric" for address of nearby Black & Decker

FACTORY SERVICE BRANCH

Free tool inspection when requested • Genuine B&D parts used • Factory-trained technicians handle all work • Standard B&D Guarantee at completion of recommended repairs • Fast service at reasonable cost.

Or write for address of nearest of 48 branches to:
THE BLACK & DECKER MFG. CO., *Dept. S-1708, Towson 4, Md.*

Black & Decker®
QUALITY ELECTRIC TOOLS

For more facts circle 664 on Reply Card

Greater Strength . . . Maximum Safety . . .

CROSBY-LAUGHLIN Load-Rated* TURNBUCKLES

guaranteed rated capacities

- Stronger hooks . . . stronger eyes . . . stronger jaws
- Big hex ends make takeup easier, faster, safer
- Most complete range of sizes
- 100% Drop forged . . . Weldless

Write for free specifications catalog listing the most complete line of drop forged fittings for wire rope and chain.

Stocked by leading distributors everywhere.

CROSBY-LAUGHLIN *Division*
AMERICAN HOIST & DERRICK COMPANY
FT. WAYNE, INDIANA

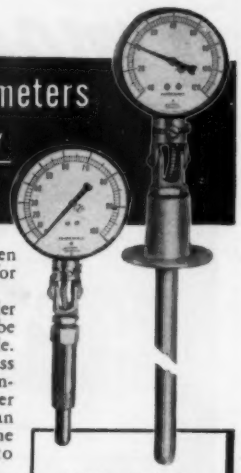
Manufacturers of Crosby Clips and "Load-Rated" Blocks . . . Crosby-Laughlin "Load-Rated" Fittings . . . Lebus Load Binders and Snatchblocks.

*Trademark

For more facts circle 665 on Reply Card

New!

Marsh Dial Thermometers *designed expressly* for piping and ducts



Here you have everything that has been so long needed in thermometers for piping and duct work.

Big 3½" and 4½" dials are far easier to read; still more important, can be turned and tilted to *any* reading angle.

Instead of illegible, breakable glass tube, you now have the readable, unbreakable Marsh—the thermometer that gives greater *readable* accuracy than any glass tube thermometer and has the famous Marsh "Recalibrator" to *keep* it accurate.

Complete line provides for every service. Separable sockets and swivel attachment nuts make connecting and disconnecting easy. Extension necks provide for insulated piping and ducts.

New bulletin covers interesting details

FOR PIPING
Ranges: 0°—100° F, 70°—120° F, 40°—240° F and 100°—300° F. ¼" NPT male connection.

FOR DUCTS
Ranges: minus 40°—120° F, 0°—160° F, 0°—220° F. Long stems extend into ducts for accurate indication.

Also available in remote reading types with 6 ft. tubing. Same ranges, sockets, stems, dial sizes.

Marsh Instrument Company
Division of Colorado Oil and Gas Corporation
Dept. W, Skokie, Ill.

Marsh Instrument & Valve Co. (Can.) Ltd. • 8407 103rd St. Edmonton, Alberta, Can.

MARSH

For more facts circle 666 on Reply Card

KO SAFETY SOLVENTS

Speed clean-up time with the greatest of ease!

KO9. . . the amazing electric motor cleaner. Simply immerse the running motor in *KO9*, remove it minutes later as clean as new.

KO9

KO9 also does an outstanding job of cleaning and degreasing motors, generators, controllers, switches, panels, instruments, refrigeration lines, etc.

KO13

is a truly sensational general purpose safety solvent that will clean just about everything . . . leaves surfaces smooth and sparkling clean!

Ask for Literature Today!

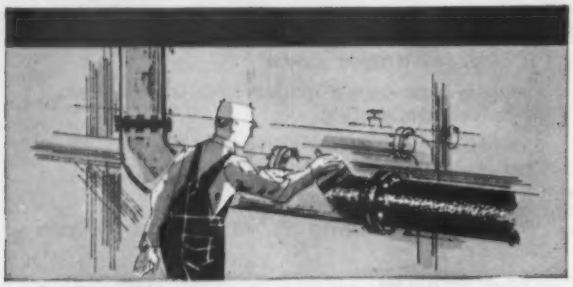
KOR CORPORATION

78 — Box 485 • Gary, Indiana

For more facts circle 667 on Reply Card

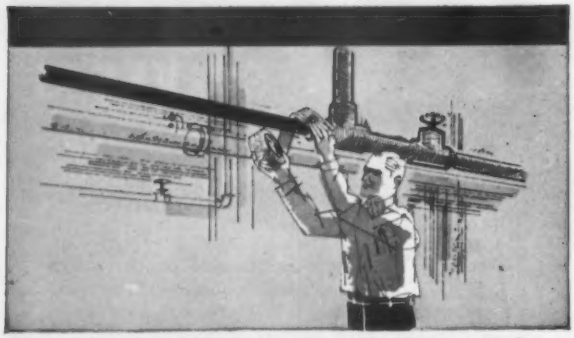
END ALL DRIP AND RUST PROBLEMS IN YOUR PLANT THESE TWO PROVEN WAYS!

Industrial plants know Mortell products offer more positive protection than any other drip-and-rust preventive. Maintenance men know that paints or compounds of paint and fish oil provide little or no permanent protection. Rust-inhibiting NoDrip Plastic Coating is a moisture-proof insulation that *does* stop condensation . . . forms a seamless jacket . . . *does* stop corrosion. NoDrip Tape, with its triple insulating barrier, is equally dependable.



For Tanks, Large Pipes, Air Ducts, Metal Equipment, Walls, Ceilings, Permanently End Condensation Drip, Rust and Corrosion With NoDRIP PLASTIC COATING

The heavy consistency of NoDrip outlasts many coats of paint or ordinary rust-preventives. Permanently insulates and protects. Applies easily with trowel, brush or special spray. Non-toxic, odorless and non-flammable. Resists acid, alkali, brine solutions or vapors. Available in 1, 5 and 55 gallon drums.



For Smaller Pipes or Tubing, Permanently End Condensation Drip, Rust and Corrosion With NoDRIP TAPE

An easy-to-use, wrap-around pipe covering, perfectly pliable, cork-filled, completely self-adhering. Forms an air-tight, 100% vapor- and moisture-proof jacket. Fits snugly even around tees, unions, angles, valves. Cuts maintenance costs—makes out-of-the-way storage areas useable—ends slip and slide floor hazards. No need for vapor seals, brads, fasteners or tools of any kind.

At all leading hardware, mill supply and plumbing jobbers. For complete information and technical handbook, write

Mortell COMPANY
597 Burch Street · Kankakee, Illinois

For more facts circle 668 on Reply Card

Six sizes . . . all variable speed, explosion-proof

GAST AIR MOTORS

Need compact, low cost power? For plant use and original equipment applications, Gast rotary-vane Air Motors offer these distinct advantages:

1. Explosion-proof power. No danger!
2. Low initial cost per rated h.p.
3. Variable speed with valve control.
4. Can't burn out from overloads.
5. Vanes take up their own wear.
6. Reversible rotation (opt.) 5 sizes.
7. Very compact — light in weight.
8. Top-quality ball-bearing design.

TYPICAL PERFORMANCE

Model No.	H.P. at 90 PSI 2000 RPM	Weight lbs.
1AM	0.13	1½
2AM	0.57	5½
4AM	1.1	8
6AM	2.0	17
8AM	4.0	25
16AM	7.0	65

Gast Manufacturing Corp.
P.O. Box 117-U
Benton Harbor, Mich.

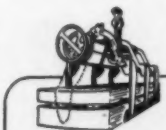
Write for Bulletins — specify models!

GAST ROTARY
"Air may be your answer!"
• AIR MOTORS TO 7 H.P.
• COMPRESSORS TO 30 P.S.I.
• VACUUM PUMPS TO 28 in.

For more facts circle 669 on Reply Card

1 man handles Sheet Steel Faster, Easier with a C-F LIFTER

C-F Lifters, under one man operation, pick up, carry and unload more sheet steel tonnage per hour than any other method – and at lower cost per ton. Wide carrying angles hold sheets securely – won't damage high grade sheets; tong action insures safe carrying; fast opening and closing adjustments of Lifter jaws permit shifting from one size pack to another in seconds. C-F Lifters are made in standard or semi-special models to handle from 2 to 60 tons.



Write for Bulletin SL-30 for specific examples of C-F Lifter operation and economy.

CULLEN-FRIESTEDT CO.
1317 South Kilbourn Avenue • Chicago 23, Illinois

For more facts circle 670 on Reply Card

ADVERTISERS IN THIS ISSUE

When writing to advertisers please tell them you saw their ad in Plant Engineering—or send us the number directly below ad—use the post card in "Bulletin Insert."

Adam Electric Co., Frank 159
Aget Manufacturing Co. 238
Air Preheater Corp. 181
Airtemp Div. Chrysler Corp. 51
Ajax Flexible Coupling Co. 218
Alan Wood Steel Co. 201
Aluminum Company of America 70, 179
Amerace Corporation
American Hard Rubber Div. 170
Amercoat Corporation 237
American Air Filter Co. 229
American Chain & Cable Co.
Wright Hoist Division 29
American Hoist & Derrick Co. 75, 239
American Machine and Metals, Inc. 205
American Standard Industrial Div. 86-87
American Vitrified Products Co. 65
Ames Iron Works, Inc. 183
Anaconda Wire & Cable Co. 26-27
Armco Drainage & Metal Products 18
Armstrong Machine Works 223

Barber-Colman Company 226, 227
Bell & Gossett Company 167
Betz Laboratories, Inc. 8-9
Black & Decker Mfg. Co. 139-140, 238
Blaw-Knox Company 221
Boiler Engr. & Supply Co., Inc. 172
Bowser, Inc. 55
Buffalo Forge Company 63
Bulldog Electric Products Div.
ITE Circuit Breaker Co. 133, 135
Butler Manufacturing Co. 30, 149

Champion Lamp Works 202
Chemtrol 165
Chicago Bridge & Iron Co. 151
Clarage Fan Company 207
Clark Door Company, Inc. 61
Cleaver-Brooks Company 62
Cleveland Tramrail Division
Cleveland Crane & Engr. Co. 24
Climax Molybdenum Co. ..... Back Cover
Colorado Fuel & Iron Corp. 203
Combustion Engineering, Inc. 163
Connor Engineering Corp. 64
Crane Company 153
Crouse-Hinds Company 41
Cullen-Friestadt, Inc. 240
Curtis Mfg. Company 220
Cyclotherm Div. National
U.S. Radiator Corp. 45

Darling Valve & Mfg. Co. 160
Davey Compressor Company 237
Dean Thermo-Panel Coil Div. 236
Dearborn Chemical Company 197
De Bothezat Fan Division
American Machine and Metals, Inc. 205
Diamond Chain Company 155
Dorr-Oliver, Inc. 198
Douglas Fir Plywood Assn. 225
Dracco Div. of Fuller Co. 189
Drave Corporation 169
Du Pont de Nemours & Co., E. I. 143

Eclipse Fuel Engineering Co. 194
Esterline-Augus Co., Inc. 234

Falk Corporation 215
Federal Pacific Electric Co. 31, 88
Fiske Bros. Refining Co. 28
Foster Company, L. B. 226
Fuller Company 36

Gal-Tronics Corporation 164
Gardner-Denver Company 48, 185
Garlock Packing Company 145
Gast Mfg. Corporation 240
General Electric Company
Apparatus Division 53-54, 82, 217
Lamp Division 199
General Radio Company 148
Georgia-Pacific Corp. 79
Globe Company
Products Division 237
Goodyear Tire & Rubber Co., Inc. 1
Goulds Pumps, Inc. 32
Graybar Electric Co. 161
Greene, Tweed & Co. 232
Grinnell Company 5

Hagan Chemicals & Controls, Inc. 235
Harnischfeger Corp. 191-192
Heinemann Electric Company 188
Homestead Valve Mfg. Co. 213

ILG Electric Ventilating Co. 12-13
Industrial Combustion, Inc. 204
Ingersoll Rand Company 206
Inland Steel Company 171
Invincible Vacuum Cleaner Mfg. Co. 176
ITE Circuit Breaker Co. ..... 71 thru 74

Jeffrey Mfg. Company 150
Jenkins Bros. 147
Johns-Manville 219
Jordan Corporation 232
Joy Manufacturing Company 23

Kerrigan Iron Works, Inc. 232
KOR Corporation 239
Korfund Company 137

Lennox Industries, Inc. 224
Link-Belt Company 19
Logansport Machine Co., Inc. 196
Louis-Allis Company 80-81
Lubriplate Division
Fiske Bros. Refining Co. 28

Mahon Company, The R. C. 67
Marley Company 190
Marsh Instrument Co. 239
Minneapolis-Honeywell 85, 203
Mixing Equipment Co., Inc. 66
Mortell Company 240

Natco Corporation 3
National Electric Products Div.
H. K. Porter Co., Inc. 231
Nesbitt, Inc., John J. 68-69
New York Blower Co. 200

Otis Elevator Company 14-15
Owatonna Tool Company 180
Oxy-Catalyst, Inc. 158

Page Fence Association 228
Pannier Corporation 184
Partlow Corporation 78
Pass & Seymour 222
Patent Scaffolding Co. 141
Perfection Industries 76-77
Pittsburgh Coke & Chemical Co. 49
Pittsburgh Corning Corp. 242
Pittsburgh Screw & Bolt Corp. 228
Porter Co., Inc., H. K.
National Electric Products Div. 231
Puritan Chemical Company 175
Purolator Products, Inc. 20

Ramset Fastening System 166
Remington Arms Company, Inc. 193
Reynolds Metals Company 44
Reznor Manufacturing Co. 157
Ridge Tool Company 208
Rockwell Mfg. Company 6-7
Rohm & Haas Company 25
Rome Cable Corporation 130-131
Ross Engineering, J. O. 47
Ryerson & Son, Inc., Joseph T. 33

Sarco Company, Inc. 177
Screw & Bolt Corp. of America 228
Sexauer Mfg. Co., J. A. 224
SKF Industries 195
Sly Mfg. Co., W. W. 186
Socony Mobil Oil Co. 34-35
Spencer Division
Metals & Controls Corp. 174
Spencer Turbine Company 178
Square D Company ..... 2nd Cover, 3rd Cover
Standard Oil Co. (Indiana) 59
Subox, Inc. 46
Sugar Beet Products Co. 162
Sun Oil Company 43

Texaco, Inc. 10-11, 173
Thomas Flexible Coupling Co. 4
Titeflex, Incorporated 57

Union Metal Mfg. Co. 168
United States Gauge 52
United States Steel Corp. 16-17

Veeder Root, Inc. 50
Vogt Machine Co., Henry 37

Western Insulated Wire Co. 236
Western Machinery Co. 234
Westinghouse Electric Corp. 38-39, 230
Whitney Chain Company 60
Wickwire Spencer Steel Div. of CF&I 203
Wide-Lite Corporation 182
Wiremold Company 230
Wright Hoist Division
American Chain & Cable Co. 29

Yarnall-Waring Company 187

POINT BY POINT

FOAMGLAS®

INSULATION

PROVED BEST

FOR THIS HIGH VOLTAGE ENGINEERING CORP. ROOF

Cut heating costs by $8,500 a year. Eliminate roof deck punctures. Stiffen the roof deck, and cut roofing installation costs. That is why High Voltage Engineering Corporation picked FOAMGLAS roof insulation for their new $1½ million plant at Burlington, Mass. A comparison of competitive roof insulations showed that FOAMGLAS alone would serve so well. Why? Consider these major comparison points:

MOISTURE RESISTANCE—FOAMGLAS had the only completely moisture-proof structure and composition . . . to insure never-changing insulating protection . . . without a separately applied vapor barrier. And since a ponded roof is used on the High Voltage plant, FOAMGLAS proves doubly valuable. Even with a puncture in the built up roofing water can't penetrate the sealed glass cells of FOAMGLAS: invaluable protection for the manufacturing of costly radiation equipment below.

COMPRESSIVE STRENGTH AND RIGIDITY—No real comparison! In fact, FOAMGLAS adds substantial stiffening to the steel roof deck. It's strong enough to withstand over seven tons per square foot . . . even helps prevent punctures of the roofing membranes.

LIGHT WEIGHT, EASE OF CUTTING—FOAMGLAS proved far superior in this combination of characteristics. Light in weight, it made it practical to design cantilevered roof deck sections. And since FOAMGLAS is easy to cut quickly and accurately with ordinary tools, it saves installation time and money.

Next time *you* face a roof insulation problem, remember these comparisons. Pick FOAMGLAS . . . now available in a *new* 1¾″ *thickness*, as well as thicknesses of 2″, 3″ and 4″. Send for our new Building Insulation Catalog. Pittsburgh Corning Corporation, Dept. PE-89, One Gateway Center, Pittsburgh 22, Pa. In Canada: 3333 Cavendish Blvd., Montreal, Quebec.

High Voltage Engineering Corp. Plant, Burlington, Mass.
Architect: Carleton R. Richmond, Jr., A.I.A., Cambridge, Mass.
General Contractor: Aberthane Construction Co., Boston, Mass.
Roofing Contractor: A. Belanger & Sons, Inc., Cambridge, Mass.

PITTSBURGH PC CORNING

For more facts circle 671 on Reply Card

Power-zOne UNIT SUBSTATIONS
HAVE EVERYTHING...INCLUDING COMPACTNESS!

Can be moved through normal commercial doorways

Save valuable space —can be placed against the wall

Capacities up to 300 KVA

• Square D designs and builds a complete line of substations for any application, indoor or outdoor—with dry or liquid-filled transformers—with large air-breakers or molded case breakers—with motor control units.

If you have any questions pertaining to substations, call in your Square D Field Engineer or write for literature describing space and cost saving with Square D's "*Power-zone*" design.

Address Square D Company, 6060 Rivard Street, Detroit 11, Michigan.

Power-zOne DESIGN PAYS OFF!

MINIMUM SIZE AND EASY HANDLING

- Only 79½" high, 36" deep and 94" wide
- All components front-accessible

EQUIPPED TO BEST FIT YOUR APPLICATION

- **High Voltage** - Air interrupter switch or oil cutouts, fused or unfused
- **Transformer** - Dry type; quiet; up to 300 KVA and up to 5 KV primary; winding taps easily accessible through front grille
- **Low Voltage** - Molded case circuit breakers; QMB fusible switches and motor starters; metering equipment. Full 72" of panel space available for these devices

EC&M HEAVY INDUSTRY ELECTRICAL EQUIPMENT...NOW A PART OF THE SQUARE D LINE

SQUARE D COMPANY

For more facts circle 672 on Reply Card

Stop these maintenance miseries (and others) in your plant...

Molysulfide™

is the cure!

Sure, problems like frozen nuts and galled spline drives won't put you out of business—but they'll put a crimp in your important maintenance schedules! The answer?

Molysulfide paste lubricants! These special lubricants—containing 25-70% Molysulfide—are tailor-made for the toughest maintenance-lubrication problems you've got. Here's why . . .

Molysulfide films out on metal surfaces. It forms a *rugged, heat- and cold-resistant, low-friction film* that prevents metal-to-metal contact even after man-sized hard knocks have pounded or squeezed base grease away. That's why Molysulfide *stays put* to lubricate as a long-term cure for such headaches as galling and seizing . . . stick-slip . . . chatter, fretting, and a whole host of other miseries. *But see for yourself!*

Try Molysulfide paste lubricants in your own shop. *Try just one pound*—order it from any of the manufacturers listed below. You'll agree—Molysulfide is worth its weight in aspirin! *Climax Molybdenum Co., a division of American Metal Climax, Inc., 500 Fifth Ave., New York 36, New York.*

CLIMAX MOLYBDENUM

Try a pound of Molysulfide paste lubricant for heavy-duty maintenance applications! Order it today from any of these well-known manufacturers: Acheson Colloids Co., Port Huron, Mich. • The Alpha Molykote Corp., 65 Harvard Ave., Stamford, Conn. • American Lubricants Co., 1227 Deeds Ave., Dayton, Ohio • Basco, Inc., 730 W. Jackson St., P. O. Box 461, Milwaukee 1, Wisc. • Bel-Ray Co., Green Village Rd., Madison, N. J. • Bemol, Inc., 131 State St., Boston 9, Mass. • Fiske Bros. Refining Co., 1500 Oakdale Ave., Toledo, Ohio • Hohman Plating & Mfg. Co., Inc., 905 East 3rd St., Dayton, Ohio • Jet Lube, Inc., 3093 N. California St., Burbank, Calif. • McGee Chemical Co., 8000 West Chester Pike, Upper Darby, Pa. • Ore-Lube Co., 11 Front St., New York, N. Y.

For more facts circle 673 on Reply Card

9

SEPTEMBER, 1959

Plant Engineering

IN THIS ISSUE

Vapor in Compressed Air—
Make It Work For You, Not Against You! 98
Controlled Voltage Is Good Business 104
HPCW Cooling System Makes Money for Synthane 106
Modified Drive for Adjustable Speed Applications 109
Automatic Arc Welder for Big Jobs 111
Construction Cost Estimating
Ill. Steel Buildings 113
Fan Shaft Repaired in Place 117
Locker and Shower Facilities—
Simplify Layout by Preliminary Planning 119
Button-Pushing Job?
Simple Cam Control System Proves Efficient 122
How Western Electric Tests and Selects Shop Racks 124
Foamed-in-Place Plastic "Fills" Many Jobs 126
Repair Parts "Giveaway" Produces Big Cost Saving 129
"Know How" Campaign Promotes Safety 131
Hard-To-Heat Building Gets Infrared "Hotfoot" 132
Editor's Report on World Lighting Conference—
Plant Engineering in Europe 134
Check That Fuel Oil! Analyses, Performances Differ 140
Laying Out Storage Space or Aisles?
Here's How To Avoid Trouble-Making Errors 142
Look to Air for Ease and Economy of Operation 150
Hawaii—AIPE's Newest Chapter 154

REGULAR DEPARTMENTS

'Round About With the Editors 2
Bulletins and Catalogs 25
Backtalk and Forethoughts 32
Plant Engineers' Digest 42
Operation and Production 62
Court Decisions 87
What's Just Ahead in This Issue? 97
News from the Plants 158
New Plant Construction 168
New Products and Processes 196
Review of New Books 268
Industrial Films 274
Data File of Commercial Literature 284
Advertisers' Index 311

The magazine that helps plant engineers with their everyday problems

Volume 13, No. 9 Circulation of this issue 51,624